Attachment A

Stream Flow Determinations and Monitoring

- **Flow Frequency Memorandum**
- **Contingency Plan Memorandum**
- **Flow Contingency Plan**

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
3019 Peters Creek Road Roanoke, Virginia 24019

SUBJECT: Flow Frequency Determination
Nanochemonics Holdings LLC (VA0000281) – Reissuance

TO: Permit File

FROM: Becky L. France, Environmental Engineer Senior BLF

DATE: February 25, 2008

Nanochemonics discharges to Peak Creek in Pulaski, Virginia. Flow frequencies are required at this site to develop the VPDES permit.

The current VPDES permit for this facility contains a special condition which requires daily stream flow measuring on Peak Creek. The special condition includes a Contingency Plan which is applied when stream flows in Peak Creek fall below 1.5 MGD.

Without the special condition and Contingency Plan, the stream flows for Peak Creek would be 0.0 cfs. The reason for this stream flow is because the Town of Pulaski WTP and Nanochemonics withdrawal are both upstream of the Nanochemonics outfall. The two withdrawals, when combined, could use all of the available flow in the stream during low flow conditions. The Contingency Plan outlines steps Nanochemonics will take to ensure their instream waste concentration does not exceed 45 percent. Therefore, the flow frequencies for the receiving stream are directly linked to the Contingency Plan and are driven by the Plan.

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
West Central Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Review of Implementation of Instream Flow Contingency Plan for Nanochemonics Holdings, LLC Revocation and Reissuance of VPDES Permit No. VA0000281

TO: Permit File

FROM: Becky L. France, Environmental Engineer Senior BLF

DATE: February 25, 2008

An Instream Flow Contingency Plan was approved by DEQ on June 21, 1996. This plan, in conjunction with instream monitoring, was required by the permit to maintain a stream flow of 1.5 MGD or an Instream Wastewater Concentration (IWC) of less than percent. The plan is to be activated whenever the stream flow drops below 1.5 MGD.

Prior to Nanochemonics' intake, the flow in Peak Creek is controlled by Gatewood Reservoir, Hogan Reservoir, and the Town of Pulaski Water Treatment Plant. None of these operations are legally obligated to maintain a minimum flow in Peak Creek and both have the capability of removing all the available water. The Town of Pulaski's water supply includes Gatewood Reservoir, Peak Creek, and Hogan Reservoir. There is no binding agreement between the Town of Pulaski and Nanochemonics which specifies a minimum flow by, or between the Corps of Engineers and Magnox which specifies a minimum release. However, Nanochemonics has been working with the Town of Pulaski on an informal basis to initiate releases from the dams when conditions result in Nanochemonics activating the Contingency Plan.

The Contingency Plan is a commitment to limit Nanochemonics' withdrawals during low flow periods. In times of low flow Nanochemonics can purchase water from Pulaski County Public Service Authority. The Authority's water source is the New River. The Contingency Plan outlines steps which Nanochemonics will initiate in the event that stream flow drops below 1.5 MGD at their gauge. The permit specifies that the plan be activated, as needed, after March 1, 1997.

The contingency plan consists of three steps to reduce potential toxicity:

1. Adjust use of Nanochemonics water intake.
2. Reduce the discharge through outfall 001 by diverting flow to Pond No. 4 for temporary holding.
3. Reduce the generation of process wastewater.

A narrative description of contingency plan activation steps taken during the permit term is attached.

The flow is measured by a submerged probe flow meter (ISCO Model 4220) with a strip chart recorder for continuous flow recording. The probe is located in a small shallow concrete structure which is attached to the creek bed. The flow meter is calibrated periodically. A table is attached of the stream flow readings for August of 2004 through November of 2007. The plan was implemented on seven occasions during this period. The stream flow has been maintained above an average monthly flow of 1.5 MGD during this monitoring period.

Summary of Instream Monitoring Problems and Contingency Plan Action: September 2005 – December 2007

September 2005 – Peak creek flow fell below 1.5 MGD on September 28 and 29, 2005. Town of Pulaski was notified each day to increase discharge from Gatewood Dam. Nanochemonics switched pumps from manual to automatic to reduce impact. However, Nanochemonics was in the middle of toxicity testing and could not make any drastic changes. Town finally notified Nanochemonics the flow was increased on September 29, 2005.

October 2005 – Peak Creek flow fell below 1.5 MGD on October 5 2005, and October 20 thru 22, 2005, and October 26 thru 28, 2005. The Town of Pulaski was notified to increase discharge from Gatewood Dam. Nanochemonics had no discharge on October 5, 2005 and part of October 6, 2005, due to dredging #4 Pond. Each other time Nanochemonics switched pumps from manual to automatic to reduce impact. However, Nanochemonics was in the middle of toxicity testing and could not make any drastic changes during the October 26 through 28, 2005, time frame. Town finally notified Nanochemonics the flow was increase. Town personnel thought the minimum requirement was 1.0 MGD.

November 2005 – Peak Creek fell below 1.5 MGD on November 4 thru 6, 2005. This was a weekend and the Town of Pulaski was notified to increase discharge from Gatewood Dam. This action corrected the following Monday and has not been problem since.

August 2006 – Peak Creek flow fell below 1.5 MGD minimum on August 29, 2006. The Town of Pulaski was notified and they increased the flow from Gatewood Dam. The creek flow returned to normal and operations continued.

May 2007 -- Peak Creek flow fell below 1.5 MGD on May 22, 2007. The intake flow to the plant was cut back until flow was normal.

September 2007 – The minimum flow of 1.4 MGD is an instantaneous value collected during the day because of a chart jam where the actual values could not be determined. This value was treated as estimated and was not used as a criteria for falling below the 1.5 MGD limit.

November 2007 – During November there were 8 days that Peak Creek flow dropped below 1.500 MGD. The IWC daily and monthly percentages were maintained below the 45 percent limit during each of these events. The standard operating procedure for maintaining flow in Peak Creek by reducing or terminating water withdrawal and/or by notification to the Town of Pulaski of the situation when not sufficient, was followed. On November 14 to 20 the flow was less than 1.5 MGD and Nanochemonics call the Town of Pulaski. Collectively it was decided to take a more proactive approach in helping to maintain the 1.500 MGD stream flow. Consequently, Nanochemonics entered into a verbal agreement whereby they established a plan to correct any low flow incidents in a more timely fashion. The agreement was that the Creek flow will be reported by e-mail to Chase Duncan and J. Goad, both from the Town of Pulaski, each day during the week so prior notification to Peak Creek water flow status would be available and corrective action taken. Also, the Nanochemonics shift supervisors have been instructed to call the Town of Pulaski if there is a low event during the weekend.

Instream Monitoring Data

	IWC (%) (45 max)		Peak Stream Flow 1.5 MGD min		*
Date	Daily Max	Mo. Ave	Mo. Ave mgd	Minimum mgd	
Aug-04	29.411	11.45	4.195	2.038	
Sep-04	18.906	10.92	8.669	2.248	
Oct-04	10.624	5.88	7.746	4.434	
Nov-04	32.620	6.77	10.144	1.166	
Dec-04	4.986	3.15	16.173	10.3	
Jan-05	14.612	7.04	10.341	3.652	
Feb-05	9.526	3.46	11.557	7.96	
Mar-05	8.748	4.03	17.141	8.531	
Apr-05	8.182	4.97	13.762	8.519	
May-05	16.273	8.01	7.009	3.27	
Jun-05	22.511	11.64	4.808	2.533	
Jul-05	23.719	11.83	6.036	1.908	
Aug-05	26.151	15.66	3.528	1.914	
Sep-05	21.66	41.11	2.752	**1.085**	*
Oct-05	37.171	15.31	1.879	**1.278**	*
Nov-05	36.609	16.57	2.194	**1.329**	*
Dec-05	19.481	13.37	3.091	2.102	
Jan-06	17.737	9.92	4.958	2.224	
Feb-06	17.881	13.23	2.975	2.370	
Mar-06	21.732	17.16	2.323	1.95	
Apr-06	22.549	11.18	6.132	1.911	
May-06	16.615	7.33	5.78	2.677	
Jun-06	15.615	12.01	3.516	2.091	
Jul-06	24.307	13.15	2.909	1.784	
Aug-06	26.225	15.32	2.203	**1.434**	*
Sep-06	22.459	13.76	2.581	1.934	
Oct-06	16.411	7.63	4.682	2.102	
Nov-06	8.498	3.89	7.211	2.729	
Dec-06	18.936	6.99	4.788	1.535	
Jan-07	3.72	2.43	11.831	6.57	
Feb-07	11.632	5.27	5.041	2.0	
Mar-07	7.146	3.11	12.899	4.376	
Apr-07	7.096	3.79	13.986	6.014	
May-07	23.809	11.62	4.599	**1.47**	
Jul-07	25.632	18.73	2.061	1.627	
Aug-07	31.70	21.49	1.988	**1.204**	
Sep-07	31.69	18.57	2.418	**1.4**	
Nov-07	35.7	25.59	1.711	**1.179**	*

IWC = Instream Waste Concentration   * = Contingency Plan Activated

MAGNOX-PULASKI INCORPORATED
CONTINGENCY PLAN AND
STANDARD OPERATING PROCEDURE FOR
MAINTAINING FLOW IN PEAK CREEK

Background

VPDES Permit No. VA000281, issued to Magnox-Pulaski Incorporated on June 28,1994, incorporates a special condition in Section I.C.4 that requires monitoring of Peak Creek flow, reporting average and maximum stream flow and instream waste concentration (IWC). This permit also includes a requirement for the development and implementation of a contingency plan to reduce the potential for instream impact if Peak Creek flow between the Magnox intake and the Magnox Outfall 001 discharge point falls below 1.5 million gallons per day (MGD).

The following plan describes the standard operating procedures (SOPs) that will be implemented by Magnox to reduce the potential for instream impact if the stream flow falls below 1.5 MGD. This plan includes the implementation of a phased approach to minimize impacts on the facility production while maintaining water quality in Peak Creek. The initial phases of this plan include measures designed to maintain instream flows at 1.5 MGD or greater, while the subsequent phases are designed to maintain an instream waste concentration of less than 45 percent effluent. This contingency plan may be revised with the approval of the Virginia Department of Environmental Quality (DEQ) upon completion of the toxicity reduction evaluation. Specifically, the minimum flow in Peak Creek that triggers implementation of this SOP may be reduced based on updated effluent toxicity data.

Stream Flow Measurement Procedures

The flow of Peak Creek is monitored on a daily basis in accordance with VPDES permit requirements (Part I.C.4.a) and as per the plan submitted to and approved by the Virginia Department of Environmental Quality. A pressure transducer is used to measure the water level in Peak Creek; the transducer output (level) is converted to stream flow rate based on actual data collected and programmed into the ISCO flow monitor (recorder). The ISCO flow meter is programed to print the daily totalized flow as well as minimum, maximum and average daily flow rates. The daily flow is recorded and the maximum daily flow rate for the month and the average flow rate for the month are reported on the monthly discharge monitoring report (DMR) reports as required by the VPDES permit.

Conditions for Implementation

When the daily flow is observed to be less than 1.5 MGD, the provisions of this plan will be implemented. A copy of the Standard Operating Procedure for implementing this plan is provided as Attachment A. It is anticipated that the procedures will be followed in the order presented, but Magnox reserves the right to implement the phased approach in any order.

MAGNOX-PULASKI INCORPORATED
CONTINGENCY PLAN (Continued)

Phase 1 - Notification

When the stream flow rate is observed to be less than 1.5 MGD, the plant manager (Carmine DiNitto) will be notified immediately. If the plant manager is unavailable the QA/QC Manager (Rendall Butler) will be notified. The plant manger or QA/QC Manager shall in turn notify the Town of Pulaski and/or the Pulaski County Public Service Authority that the contingency plan has been implemented to ensure that sufficient quantities of water are available to purchase. DEQ shall be notified that the contingency plan has been implemented with the monthly DMR as specified in the VPDES permit.

Phase 2 - Adjust Use of Magnox Water Intake

The first step to maintain the flow of Peak Creek at or above 1.5 MGD is to reduce or terminate water withdrawal from Peak Creek. The plant manager or his designee will notify the Magnox staff to reduce the flow rate of water withdrawn from Peak Creek to maintain 1.5 MGD at the flow monitoring site. If needed to maintain instream flows, water withdrawal by Magnox will be eliminated. Additional process water will be purchased from the Town of Pulaski or from the Pulaski County Public Service Authority. Daily flow measurements will continue throughout this period. When stream flow rate reaches or exceeds 1.7 MGD, water withdrawals may be reinitiated. Withdrawals will be restricted as necessary to ensure that the stream flow rate is maintained at greater than 1.5 MGD. If, after implementation of the Phase 2 withdrawal termination, stream flows are still less than 1.5 MGD, Phase 3 procedures will be implemented.

Phase 3 - Reduce the Discharge Through Outfall 001

The Magnox wastewater treatment system includes a series of four sedimentation basins, three of which are used for wastewater processing at any one time. The fourth basin will be used as a temporary holding basin or as an emergency containment basin in the event of treatment process failure or tank release. When termination of water withdrawals by Magnox does not maintain the stream flow rate at 1.5 MGD, effluent discharge by Magnox will be reduced by directing a portion of the wastewater effluent from the first basin (Pond 3) to the temporary holding basin (Pond 4).

The settling pond system through which the effluent flows prior to discharge can be used to divert and hold up to approximately 900,000 gallons effluent. By not discharging the entire effluent the IWC is reduced and potential water quality effects are reduced. The ponds will be used to maintain the IWC below 45 percent. Instream waste concentration is calculated as follows:

$$= \frac{\text{Effluent Flow (MGD)}}{\text{Effluent Flow (MGD)} + \text{Stream Flow (MGD)}}$$

The allowable effluent flow to maintain a IWC of 45 percent as a function of stream flow rate is calculated by the following equation:

$$= \frac{0.45 \times \text{Stream Flow (MGD)}}{(1 - 0.45)}$$

Implementation of the wastewater diversion and effluent discharge reduction procedure could provide several diversion and final discharge options including:

1. A ten percent reduction in effluent flow for ten days;
2. A twenty percent reduction in effluent flow for five days;
3. A fifty percent reduction in effluent flow for two days; or
4. Any other reduction desired.

Effluent and stream daily flow measurements will continue throughout this period. When stream flow rate exceeds 1.7 MGD, normal effluent discharges will resume. The wastewater held in the temporary holding basin will be slowly released into Pond 3 (the first basin) for completion of treatment and discharge. As stream flows increase, Phase 2 measures may be terminated as described previously. If, after implementation of the Phase 3 discharge reduction, stream flows are still less than 1.5 MGD, Phase 4 procedures will be implemented.

Phase 4 - Reduce the Generation of Process Wastewater

If Phase 3 procedures do not maintain an instream waste concentration of 45 percent or less, process wastewater generation will be reduced to the extent practicable. The processes that generate significant amounts of concentrated wastewater will be scaled back or eliminated first. Next, processes that consume large quantities of water will be scaled back. The instream waste concentration will be recalculated upon implementation of each effluent flow reduction measure using the formulas depicted in the previous section.

As a last resort production processes that generate wastewater will be discontinued until the stream flow rate increases to levels that will maintain an instream waste concentration of 45 percent or less.

Stream flow measurement will continue throughout this period. As the stream flow rate increases, Phase 4 through 2 measures will be terminated in reverse order.

ATTACHMENT A
STANDARD OPERATING PROCEDURE FOR MAINTAINING FLOW IN PEAK CREEK

Phase 1 - Notification

Notify the Plant Manager.

Phase 2 - Adjust Use of Magnox Water Intake

- Reduce or terminate water withdrawal from Peak Creek
- Purchase additional water from Town/County to supplement
- Continue to monitor stream flow
- Return to normal withdrawals when measured stream flow $\geq$ 1.7 MGD
- If flow $\leq$ 1.5 MGD upon termination of withdrawal proceed to Phase 3

Phase 3 - Reduce the Discharge Through Outfall 001

- Reduce the effluent flow from 001 by diverting effluent flow from Pond 3 to Pond 4 (temporary holding basin).
- Continue to monitor stream flow
- Return to normal discharge when measured stream flow $\geq$ 1.7 MGD; gradually reintroduce wastewater stored in Pond 4 for treatment
- If stream flow continues to increase Magnox withdrawals can be reinitiated as long as measured stream flow $\geq$ 1.7 MGD
- If flow $\leq$ 1.5 MGD upon reduction in discharge proceed to Phase 4

Phase 4 - Reduce the Generation of Process Wastewater

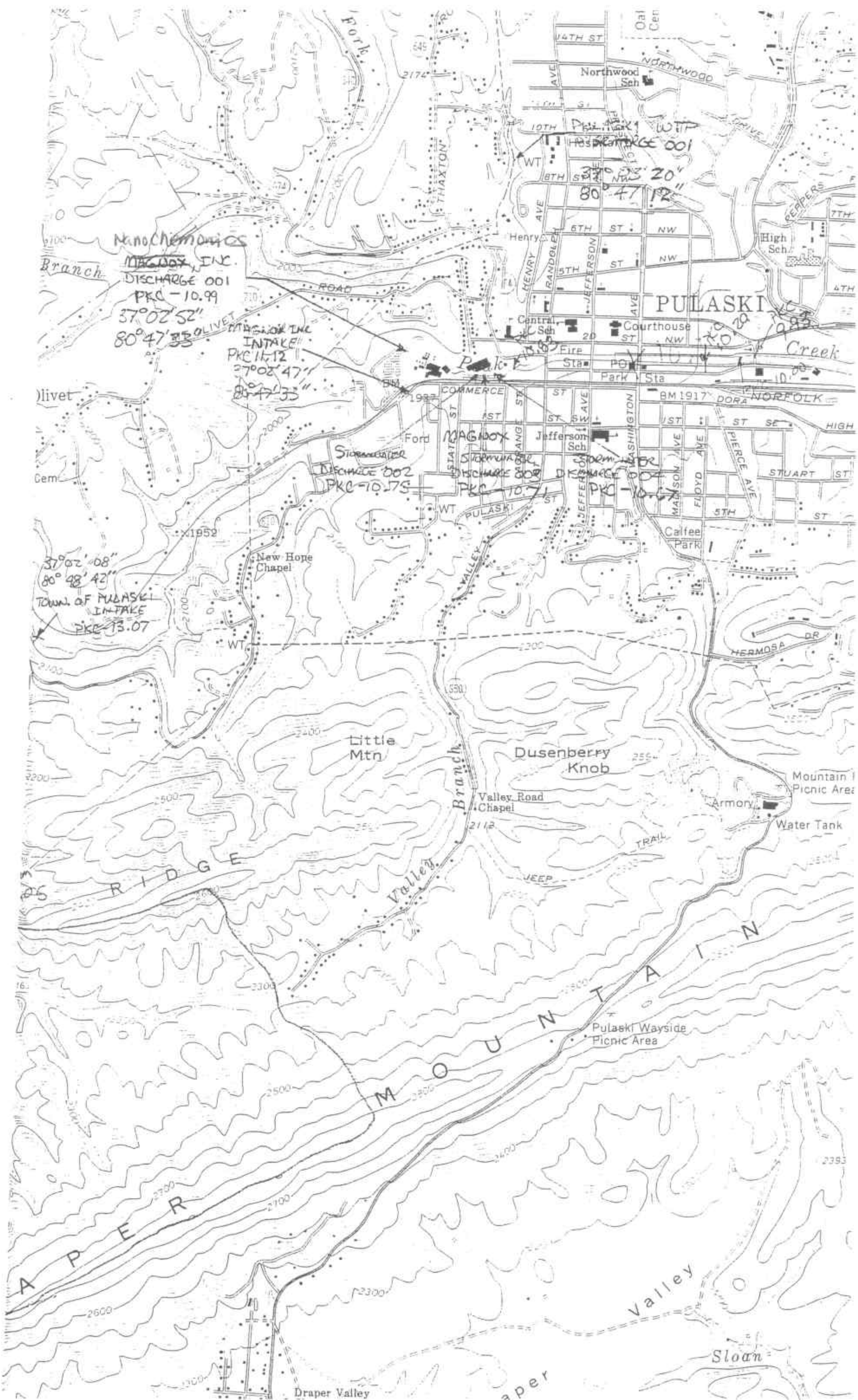
- Reduce effluent flow by reducing production and wastewater generation processes to ensure instream waste concentration <45 percent
- Continue to monitor stream flow
- Resume normal production when measured stream flow exceeds 1.5 MGD

Initial Issue
Date: June 17, 1996

Attachment B

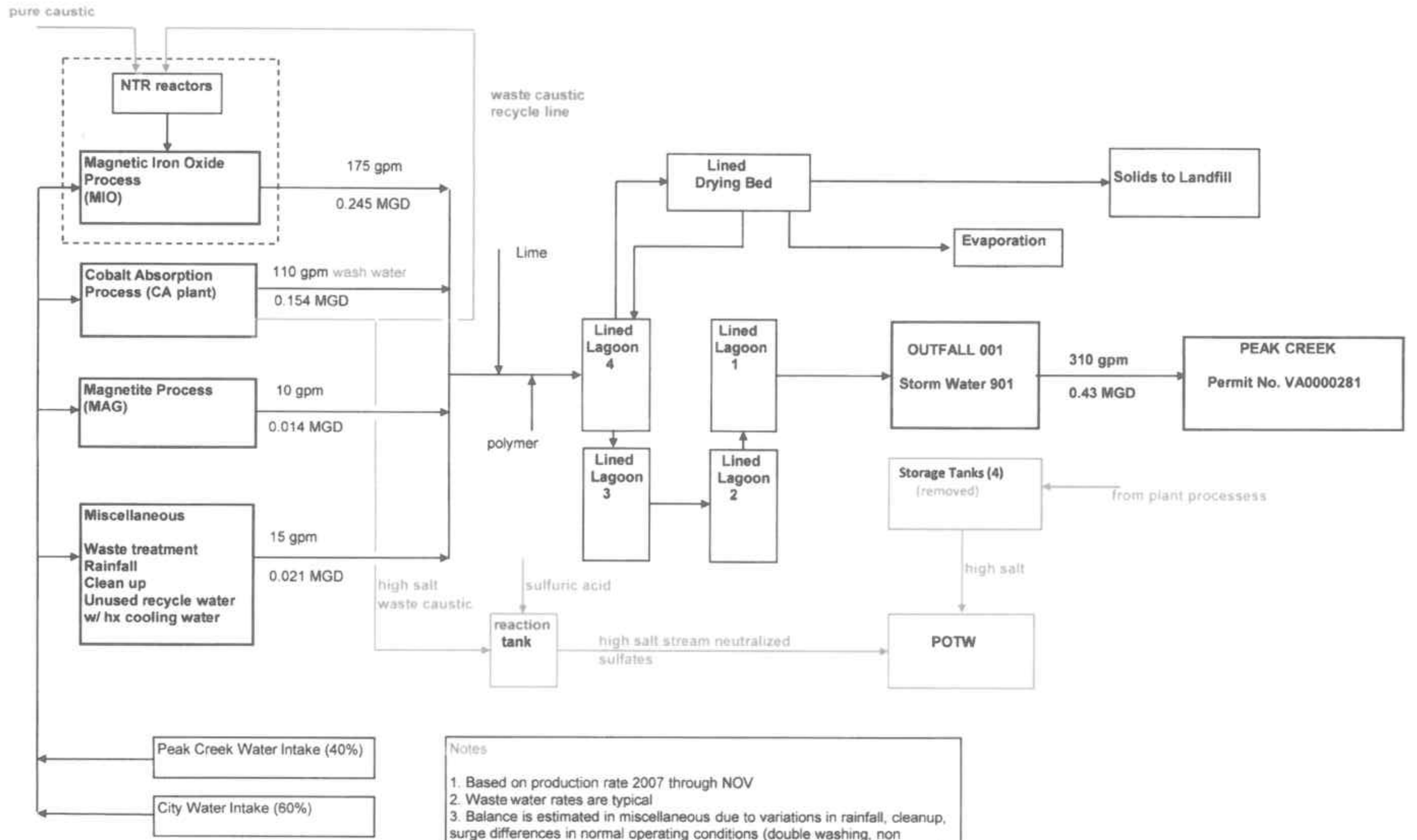
Maps and Diagrams

- Flow Diagram
- Site Map
- Topographic Map



PULASKI WTP
DISCHARGE 001
37°03'20"
80°47'12"
Nanochemonics
MAGNOX, INC
DISCHARGE 001
PKC – 10.99
37°02'52"
80°47'33"
MAGNOX INC
INTAKE
PKC 11.12
37°02'47"
80°47'33"
Stormwater
Discharge 002
PKC-10.75
MAGNOX
Stormwater
Discharge 003
PKC-10.71
Storm water
Discharge 004
PKC-10.67
37°02'08"
80°48'42"
TOWN OF PULASKI
INTAKE
PKC-13.07
PULASKI
Northwood Sch
High Sch
Central Sch
Courthouse
Fire Sta
PO
Park Sta
Jefferson Sch
Calfee Park
Henry
Ford
Olivet
Cem
Branch
Fork
Creek
14TH ST
NORTHWOOD
COMMERCE
NORFOLK
BM 1917
STUART
HERMOSA DR
New Hope Chapel
Little Mtn
Dusenberry Knob
Valley Road Chapel
Armory
Water Tank
Pulaski Wayside Picnic Area
JEEP TRAIL
Valley Branch
RIDGE
APER MOUNTAIN
Valley
Sloan
Draper Valley

OVERALL WATER FLOW BALANCE
2007



Overall plant production has been reducing from 1997 to present thereby reducing the waste treatment load. (550 t/mo --- 150 t/mo (avg))

Magnetite production was reduced significantly; a source of high salt content thereby reducing the load on waste treatment.

Largest product is CA plant (60-70%) producing waste caustic. This was neutralized creating high salt.
It is now recycled into the NTR reactors reducing volume of pure caustic needed and producing iron oxide products.

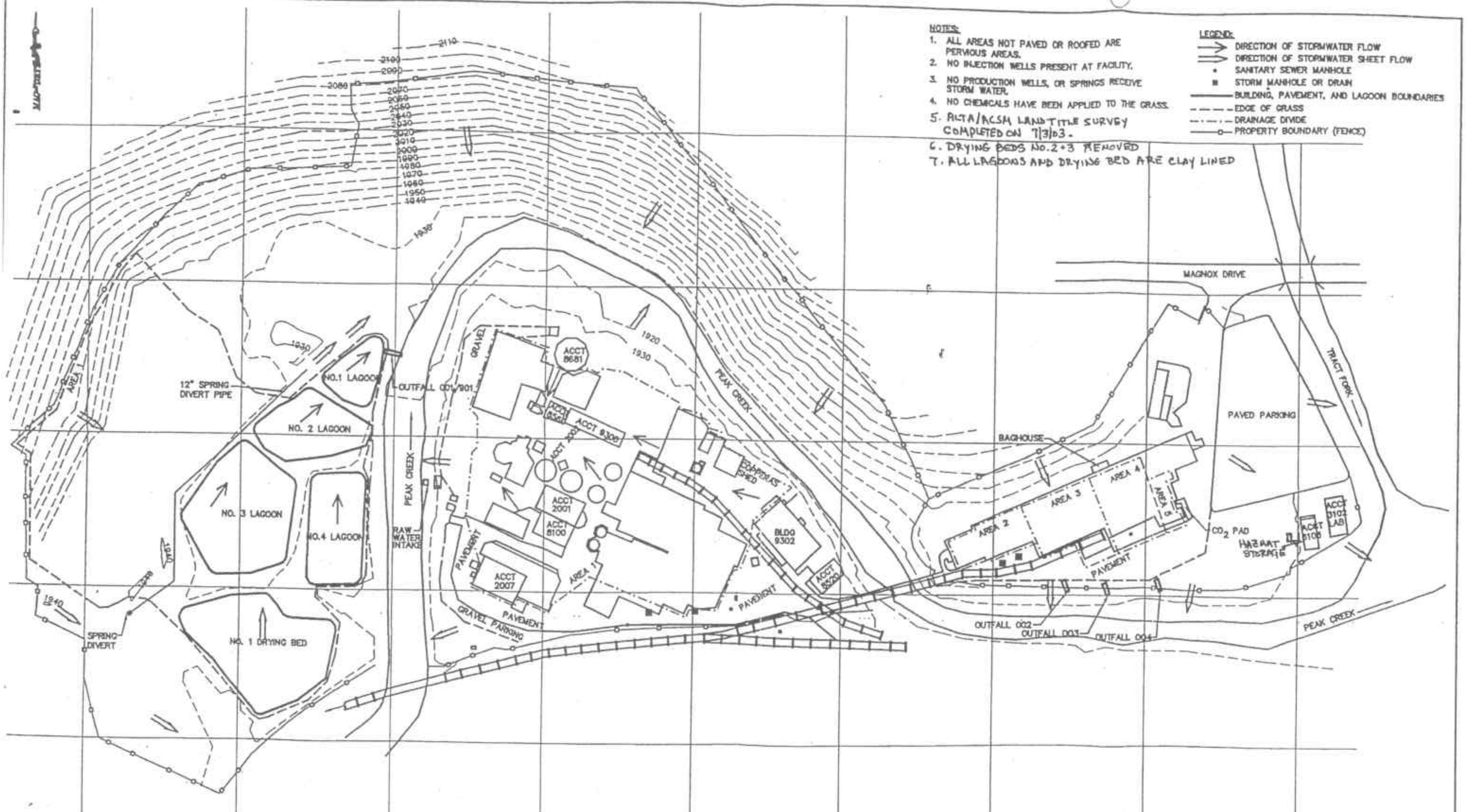
Notes

1. Based on production rate 2007 through NOV
2. Waste water rates are typical
3. Balance is estimated in miscellaneous due to variations in rainfall, cleanup, surge differences in normal operating conditions (double washing, non conformities, general processing variations i.e press washing, batch sizes etc.

Blue line is recycle piping back to NTR reactors. Installed to reuse caustic stream rather than neutralization with sulfuric acid. Sulfate load is reduced significantly

Red line is old piping to neutralization tank with sulfuric acid and then discharged to the POTW. No longer being done.

Green line is make up caustic from main storage tank. Virgin caustic is reduced by approximately 50%



NOTES:
1. ALL AREAS NOT PAVED OR ROOFED ARE PERVIOUS AREAS.
2. NO INJECTION WELLS PRESENT AT FACILITY.
3. NO PRODUCTION WELLS, OR SPRINGS RECEIVE STORM WATER.
4. NO CHEMICALS HAVE BEEN APPLIED TO THE GRASS.
5. ALTA/ACSM LAND TITLE SURVEY COMPLETED ON 7/3/03.
6. DRYING BEDS NO. 2+3 REMOVED
7. ALL LAGOONS AND DRYING BED ARE CLAY LINED

LEGEND:
- DIRECTION OF STORMWATER FLOW
- DIRECTION OF STORMWATER SHEET FLOW
- SANITARY SEWER MANHOLE
- STORM MANHOLE OR DRAIN
- BUILDING, PAVEMENT, AND LAGOON BOUNDARIES
- EDGE OF GRASS
- DRAINAGE DIVIDE
- PROPERTY BOUNDARY (FENCE)

OLVER LABORATORIES
Environmental Services-Environmental Laboratories
1116 SOUTH MAIN STREET
BLACKSBURG, VIRGINIA 24060
(540)552-5974

Designed: ALM	Scale: 1"=150'	NANOCHEMONICS HOLDINGS, LLC	
Drawn: GEM	Job No.: 51341.51		
Checked: GLF	Date: SEPT. 16,1998	SITE MAP	

Rev.	Description	Date	By
4	PERMIT REISSUANCE APP. ISSUE	9/04/03	CAD
3	PERMIT REISSUANCE APP. ISSUE	9/29/98	RLH
2	PERMIT REISSUANCE APP. ISSUE	11/22/93	RLH
1	PERMIT APPLICATION ISSUE	10/1/92	GLF
0	DESIGN ISSUE	2/19/91	JWO

Figure No.: 1.2

File Name: 51341.51\MAGSITE

Attachment C

Site Inspection Reports and Process Description Summary

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY

WEST CENTRAL REGIONAL OFFICE

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Pretreatment Inspection for Sulfates from Nanochemonics

TO: Steve Dietrich

FROM: Kip Foster, Lewis Pillis, Lynn Wise and Becky France

DATE: February 28, 2007

On February 27, 2007, staff listed above met with Rhendal Butler, and Carmine DiNitto, of Nanochemonics Holdings, LLC, Robbie Graham, Peppers Ferry Technical Services Manager, and Terry Nester, Engineering Assistant, Town of Pulaski, to conduct a pretreatment inspection and discuss options for reducing the sulfate being discharged from the facility.

Lynn opened the meeting by discussing the pretreatment inspection process. Kip explained that the DEQ staff were present to learn as much about the process as possible and discuss options for reducing the sulfate discharges from the plant. Carmine explained the ideas he had about developing more dilution in the receiving stream so they could shift some of the pollutant load to the stream and away from the treatment plant at Peppers Ferry and still meet a toxicity limit in their VPDES permit. Kip explained that as an environmental agency it would be difficult for us to support discharging more toxic pollutants into the environment and asked if there were other opportunities we could support. After further discussion we agreed that there will probably be several solutions to the problem and if those solutions could be explained in economic development terms, i.e. new products from captured wastes, then we would have a greater potential for finding funding for any capital expenditures to install the technology. Lynn, Rhendal and Robbie proceeded with the pretreatment inspection while those remaining discussed several possible solutions.

1. The concentrated sulfate flow from the facility has been reduced from 75 gal/min to 15 gal/min. The evaporator design and cost developed 10 years ago was for a 100 gal/min unit so Carmine was going to go back and investigate the costs/design of a smaller pretreatment unit. Trace metals must be removed from the waste stream if recovered sodium sulfate is to be marketed. Lewis suggested that the sulfate stream could be concentrated using reverse osmosis [RO] so that a smaller pretreatment unit would be needed. Purified water would be a by-product of the RO process.

2. We discussed further reduction of flow by continuing to discharge some of the 15 gal/min concentrated sulfate flow to the Town of Pulaski sewer system (if it could be based on overall concentration (loading?) from the Town) and treating the remaining portion with a small evaporator system.

3. Carmine discussed the possibility of substituting magnesium hydroxide for sodium hydroxide in the process to potentially reduce the corrosive effects and toxicity of the effluent. He also stated that this has economic advantages in their manufacturing process. Some reductions in sodium loading may also be achieved by evaluating additional recycling options.

4. Lewis mentioned technology where metallic particles are removed from the waste stream using magnets. The company, Descal-A-Matic, www.descal-a-matic.com, is based in Norfolk and supplies units to treat boiler water. Carmine discussed another process using a magnetic grid in some detail and if we could demonstrate this process on the company's own wastewater it may be an avenue for selling their product as a waste treatment aid.

5. Carmine also mentioned the use of iron oxide nanoparticles as a possible treatment additive for the removal of phosphorus in sewage treatment systems. There is an emerging need for this product with all the treatment plant improvements being constructed to meet the Chesapeake Bay nutrient removal requirements.

We agreed to meet at a future date to share our findings and prepare a plan or a series of solutions for consideration by the management of all parties. Carmine noted he had to discuss these issues with his management before proceeding but would get back in touch with us. It was clear that the management team on site at Nanochemonics wears multiple hats and will find it difficult to research these issues while keeping the current plant operational. Any research and development assistance to further evaluate these options would be a good start toward a solution to the problem. We concluded the inspection with a tour of the plant.

France,Becky

From: Pillis,Lewis
Sent: Thursday, March 01, 2007 10:34 AM
To: France,Becky; Foster,Kip; Wise,Lynn
Subject: FW: Nanochemonics toxicity

Please see DD response

Sincerely;

Lewis J. Pillis, P.E.
VA DEQ
540-562-6789 fax - 540-562-6860
http://www.deq.virginia.gov

-----Original Message-----
From: DeBiasi,Deborah
Sent: Wednesday, February 28, 2007 5:04 PM
To: Pillis,Lewis
Subject: RE: Nanochemonics toxicity

There isn't any decent data on Ecotox on these chemicals/organisms. Have them test it with bioassays, both organisms before allowing a change.

-----Original Message-----
From: Pillis,Lewis
Sent: Wednesday, February 28, 2007 4:15 PM
To: DeBiasi,Deborah
Cc: France,Becky; Foster,Kip; Wise,Lynn
Subject: Nanochemonics toxicity

The facility formerly known as "Magnox" was visited by WCRO. Sulfate is being added as a local limit at Peppers Ferry, so Mr. Dinitto wants to discharge again.

Mr. Dinitto believes that substituing MgOH for NaOH will have a WET benefit. We would like some assistance confirming/denying our suspicion that magnesium sulfate will be just about as toxic as sodium sulfate. This is a high profile issue with Legislative interest.

Sincerely;

Lewis J. Pillis, P.E.
VA DEQ
540-562-6789 fax - 540-562-6860
http://www.deq.virginia.gov

France,Becky

From: France,Becky

Sent: Wednesday, February 28, 2007 10:56 AM

To: Pillis,Lewis; Foster,Kip; Wise,Lynn

Subject: RE: site visit smmary.

Yes, I think he mentioned iron oxide nanoparticles to remove phosphorus. I have added recycling and product mix changes.

-----Original Message-----
From: Pillis,Lewis
Sent: Wednesday, February 28, 2007 10:39 AM
To: Foster,Kip; Wise,Lynn; France,Becky
Subject: RE: site visit smmary.

I added some info, please make sure all of you agree with the changes, esp where I thought Carmine said **nanoparticles** could be used for phosphorus removal.

Sincerely;

Lewis J. Pillis, P.E.
VA DEQ
540-562-6789 fax - 540-562-6860
http://www.deq.virginia.gov

-----Original Message-----
From: Foster,Kip
Sent: Wednesday, February 28, 2007 9:44 AM
To: Wise,Lynn; France,Becky; Pillis,Lewis
Subject: site visit smmary.

Here is a draft of the site visit memo. You can find it at wpermits/ vpdes & vpa permits/Nanochemonics. If we can edit one copy and keep it here that would be great. I need some help with last names and feel free to add action items or edit any if you want. Steve needs a short summary to share with Congressmen Boucher's office. Thanks

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
INDUSTRIAL USER INSPECTION REPORT

A. General Information

INSPECTION DATE:	**February 27, 2007**	TIME:	**10:00 a.m.**
INSPECTION PURPOSE:	**Routine – SIU**		
INDUSTRY NAME:	**NanoChemonics Holdings, Inc.**	PERMIT #:	**PS0103**
SITE LOCATION:	**1 Magnox Dr., Pulaski, VA 24301**		
CORRESPONDENCE ADDRESS:	**Same**		
RECEIVING POTW:	**Pepper's Ferry Regional Wastewater Treatment Authority – VA0062685**		

PARTICIPANTS:	NAME/TITLE:	PHONE #:
DEQ INSPECTOR:	**Lynn V. Wise, Pretreatment Coordinator, WCRO**	**(540) 562-6787**
SIU CONTACT:	**Rhendall Butler, Environmental/Quality Manager**	**(540) 980-3500**
POTW REPRESENTATIVE:	**Robert L. Graham, Technical Services Manager, PFRWTA** **Terry Nester, Engineering Assistant, Town of Pulaski**	**(540) 639-3947** **(540) 994-8616**
OTHER:	**Kip Foster, Lewis Pillis, Becky France – DEQ/WCRO**	**(540) 562-6700**

IS THE SIU SUBJECT TO CATEGORICAL PRETREATMENT STANDARDS? [ ] YES [X] NO

IF YES, LIST CATEGORIES AND APPLICABLE LIMITS: **N/A** [ ] PSES [ ] PSNS

TYPE OF OPERATION OR PRODUCTS AND APPLICABLE SIC CODES:

Manufacturer of iron oxide pigments/nanoparticles SIC Code: 2816 (Inorganic Pigments) NAICS Code: 325131 (Inorganic Dye and Pigment Manufacturing)

# OF EMPLOYEES PER SHIFT:	**41***	1ST		2ND		3RD

HOURS OF OPERATION: **41 total employees, 3 shifts/day, 5 days/week sometimes more dependent on work**

TOTAL DAILY FLOW OF INDUSTRIAL WASTE:	**21,600***	GPD MAX	**21,600***	GPD AVG
TOTAL DAILY FLOW OF SANITARY WASTE:	**820**	GPD MAX	**820**	GPD AVG

SOURCE OF FLOW INFORMATION: ***Pumps regulating industrial flow are set to discharge 15 gpm in order to provide a consistent flow rate to the POTW. The sanitary flow is estimated using 20 gal/person/day.**

ARE THE SANITARY AND INDUSTRIAL WASTEWATER STREAMS COMBINED?	X	YES		NO
PRIOR TO WASTEWATER TREATMENT?		YES	X	NO
PRIOR TO CONNECTING TO THE POTW SANITARY SEWER?	X	YES		NO

Flows are combined at the Town of Pulaski manhole, after the industrial sampling point (outfall 005)

B. Facility Diagram

See attachments.

C. Industrial Processes and Pretreatment

1. DESCRIBE THE BASIC INDUSTRIAL PROCESS AND ANY CONSTITUENT UNIT OPERATIONS. INCLUDE AUXILIARY OR UTILITY PROCESSES, SUCH AS BOILER OR COOLING TOWER BLOWDOWN AND HEATING OR COOLING STREAMS WHICH DISCHARGE TO THE POTW. SKETCH OR ATTACH A BLOCK PROCESS FLOW DIAGRAM, NOTING WHICH PROCESS STEPS GENERATE WASTEWATER.
2. INDICATE WHICH OF THESE WASTEWATER STREAMS RECEIVE SOME FORM OF PRETREATMENT.

The company manufactures synthetic iron oxide pigments, including transparent oxides, for the magnetic recording industry and as a component of toners for copy machines and laser printers. Colored pigments are produced for the cosmetic industry and for paints. Transparent oxides account for about 5% of the current product, but the percentage changes based on need.

Soluble and metallic sources of iron are converted by aqueous and thermal processes into iron oxide pigments. The process involves ferrous sulfate (copperas) purification, precipitation of ferrous hydroxide from ferrous sulfate and/or powdered iron and sodium hydroxide, particle synthesis and growth, filtration (dewatering), washing, and drying in the production of goethite/synthetic iron oxides. Particle characteristics and surface modifications are controlled in reaction processes through temperature, chemical additions, etc. to meet specific product and customer demands. The iron oxide material, some of which is processed by cobalt absorption to further enhance surface characteristics, is then converted to magnetic iron oxide through calcinations, densification, and blending. The product is then packaged for shipping.

High strength sodium sulfate wastewater generated from the filtration step noted above is flocculated and allowed to settle in one of 2 plate clarifiers (one for yellow goethite and one for magnetite) with the effluent discharged to a 40,000-gallon tank to the PFRWTA in accordance with the SIU permit. A large holding tank (#431) has been installed for equalization and storage. Pumps regulating the discharge of the wastewater have been set to continuously pump at a rate of 15 gpm in order to minimize any effects to the regional system biomass.

In addition, contact cooling water, comprised of cracker cooling water (~6375 gpd), compressor cooling water (~2750 gpd), and kiln cooling water (~3375 gpd) is generated in the magnetic iron oxide conversion building and potentially contains fugitive dust and oil & grease. This cooling water is discharged to a collection pit where some settling occurs and where any surface oils and grease are removed by an absorbent boom. The company has installed two pumps and a piping system to recirculate the water back through the cooling system.

Other processes and industrial wastewater flows, including any leakage, spillage, and runoff from the manufacturing operations, as well as boiler blowdown and any other utility wastestreams, are treated on-site. Treatment is by pH adjustment, aeration, flocculation, and sedimentation in a series of ponds, and the effluent in discharged to Peak Creek under a VPDES permit. Sludge is dewatered in an earthen drying bed.

3. DESCRIBE THE PRETREATMENT SYSTEM USED BY THE FACILITY. IF THE SYSTEM HAS MULTIPLE PROCESS STEPS, PROVIDE A BLOCK DIAGRAM INDICATING THE TREATMENT STEPS AND THEIR SEQUENCE.

Flocculant may be added to the filtrate from the filtration of hydrous iron oxide prior to entering one of two mixing tanks (one for each of the two main product types). The wastewater then flows into one of two lamella clarifiers. Settled floc is recovered and returned to the process, while supernatant from both clarifiers is discharged into a 40,000-gallon equalization/storage tank. pH is adjusted using CO_2 or by adding material from tank #431 prior to discharge.

4. IS THE PRETREATMENT FACILITY PROPERLY OPERATED AND MAINTAINED? (PERTINENT CHARACTERISTICS TO CHECK MIGHT INCLUDE THE AVAILABILITY OF STANDBY POWER, ALARM SYSTEMS, OPERATIONAL MANUALS, CALIBRATION OF CONTROL INSTRUMENTATION, AND DISPOSAL OF SLUDGES AND ROUTING OF LIQUID RETURN FROM SLUDGE DEWATERING EQUIPMENT.)

No problems were noted at the time of the inspection and the facility has, generally, been in compliance with the limitations in the current SIU permit. However, the PFRWTA Board recently adopted more stringent local limits for Total Dissolved Solids (TDS) and sulfates. The current pretreatment facilities are not capable of achieving compliance with these new limitations and additional treatment facilities will most likely be necessary.

5. LIST POLLUTANTS AT THE PLANT, CATEGORIZED AS FOLLOWS:
POLLUTANTS THAT COME INTO DIRECT CONTACT WITH THE WATER THAT IS DISCHARGED TO THE POTW:

Iron hydroxide, trace metals from raw materials, $NaSO_4$, oils & grease

POLLUTANTS THAT DO NOT COME INTO DIRECT CONTACT, BUT HAVE THE POTENTIAL TO ENTER THROUGH SPILLS, MALFUNCTIONS, ETC.:

None identified.

6. DOES THE FACILITY HAVE ANY AIR POLLUTION CONTROL EQUIPMENT THAT GENERATES WASTEWATER? **X*** YES ☐ NO

There are four scrubbers on washwater filters, but the wastewater discharges to outfall 001 (VPDES permit)

IF YES, IS THIS WASTEWATER ACCOUNTED FOR IN THE PERMIT APPLICATION AND PERMIT? **N/A** ☐ YES ☐ NO

IF YES, DESCRIBE THE FLOW RATE, COMPOSITION, AND THE DISCHARGE METHOD AND LOCATION: **N/A**

7. IS THE FACILITY A RCRA HAZARDOUS WASTE GENERATOR (EITHER THROUGH THE BASIC PROCESS OR RESIDUALS FROM TREATMENT PROCESSES)? [X] YES [ ] NO

EPA ID #: **VAD153226932 (small quantity conditional generator)**

HAS THE INDUSTRY SUBMITTED THE REQUIRED HAZARDOUS WASTE NOTIFICATION TO THE POTW OF THE DISCHARGE OF ANY WASTE THAT, IF OTHERWISE DISPOSED OF, WOULD BE A HAZARDOUS WASTE? [ ] YES [ ] NO **N/A**

DATE OF THE LETTER: **N/A**

DESCRIBE THE ~~HAZARDOUS~~ WASTE STORAGE AND DISPOSAL PROCEDURES TO INCLUDE RESIDUALS FROM THE PRETREATMENT SYSTEM. (HAULER & DISPOSAL LOCATION):

MATERIAL	STORAGE	TRANSPORTER*	DISPOSAL SITE*	COMMENTS
Sludge from drying bed	**Drying bed**	**Hauled to New River Resource Authority**	**NRRA – Solid Waste Management Facility (Cloyd's Mountain Landfill)**	
Laboratory hazardous waste	**55-gallon drums (can store up to 5; currently <1 drum)**	**Environmental Options, Inc. (last removed 10/16/06)**	**Giant Resource Recovery - Sumter, SC**	**Treated at Sumter, SC**
Waste oil and grease	**55-gallon drums at maintenance shop**	**Holston Co.**	**NA**	**Recycled**
Other solid waste	**Dumpsters/roll-off**	**Waste Management**	**Landfilled (Pulaski Co.)**	

***Transporter/Disposal Site Addresses:**
New River Resource Authority - P.O. Box 1246/7100 Cloyd's Mountain Road, Dublin, VA 24084; (540)674-1677
Environmental Options, Inc. - PO Box 879, Rocky Mount, VA 24151; (540) 483-3920
Giant Resource Recovery Sumter, Inc. – 755 Industrial Road, Sumter, SC 29150
Holston Companies – 2960 Griffith Rd., Winston-Salem, NC 27103;

D. Sampling

1. ALL THE REQUIRED GRAB OR COMPOSITE SAMPLES BE COLLECTED AT THE DESIGNATED LOCATION(S)? [X] YES [ ] NO

2. WHERE IS THE SAMPLE POINT(S) LOCATED? (IF POSSIBLE, NOTE ON THE WASTEWATER DISCHARGE SCHEMATIC FOR SECTION A OF THIS CHECKLIST).

A sampling shed is located adjacent to the 40,000-gallon holding tank that houses the flow monitoring and sampling instrumentation. All sampling is performed above ground. Grab samples may be taken directly from a spigot on the sampler feed line. Composite samples are time proportional (sample taken every 15 minutes for 24 hours. The discharge point is known as "outfall 005".

3. DOES THE INDUSTRY PERFORM SAMPLING AND/OR ANALYSES REQUIRED FOR SELF-MONITORING "IN-HOUSE"? [X] YES [ ] NO

Analysis for all parameters except chromium is performed in-house. AA analysis is used for other metals (zinc, nickel, sodium); sulfates, total solids, TSS, TDS, volatile solids, pH also performed. Scales and oven thermometers calibrated at least annually. ProChem Analytical performs the chromium analysis.

4. IF IU CONDUCTS ANALYSIS, IS THE ANALYSIS PERFORMED IN ACCORDANCE WITH EPA SPECIFIED METHODS? [X] YES [ ] NO

5. IS SAMPLING CONDUCTED ACCORDING TO EPA OR APPROVED METHODOLOGIES? [X] YES [ ] NO

   IF CONTRACT LABORATORY(S) IS USED, RECORD THE NAME AND BUSINESS ADDRESS:

   ProChem Analytical Inc., 6040 North Fork, Elliston, VA 24087

6. IF USED FOR PERMIT COMPLIANCE, IS FLOW METER(S) CALIBRATED? [X] YES [ ] NO

   DATE OF LAST CALIBRATION: **June 5, 2006; however, difficult to maintain calibration at the low level of 15 gpm**

7. IF USED FOR PERMIT COMPLIANCE, IS PH METER(S) CALIBRATED AND DOCUMENTED? **N/A** [X] YES [ ] NO

   Daily calibration records are kept.

E. Spill Prevention

1. DOES THE FACILITY HAVE A SLUG/SPILL PREVENTION OR CONTROL PLAN? [X] YES [ ] NO

   DATE LAST UPDATED: **2006, as part of the facility's SWPPP. A plan has not been required by PFRWTA.**

2. SINCE THE LAST INSPECTION, HAVE THERE BEEN ANY SPILLS? [ ] YES [X] NO

3. ARE PROCESS CHEMICALS STORED IN CONTAINED AREAS? [X*] YES [ ] NO

   ***The facility has a SPCC plan that addresses use and storage of all materials on site. Spill control and containment materials are available and the plant layout is such that any spillage or leakage is directed to the treatment ponds through a trench system. Piles of raw materials are located outdoors. Caustic is received by rail or truck and ferrous sulfate (copperas) is received by truck. There are outdoor storage sheds and tanks. The acid area is bermed and there is a containment wall around the copperas area.**

4. ARE THERE FLOOR DRAINS IN THE FACILITY? [X*] YES [ ] NO

   IF YES, DO THE FLOOR DRAINS DISCHARGE TO THE SANITARY SEWER OR STORM SEWER?

   ***No, all floor drains go to the trench/ditch system. The wastewater flows from the trench to the treatment ponds and discharges through outfall 001 (VPDES Permit No. VA000281).**

5. IS THERE A POTENTIAL FOR SPILLED PROCESS CHEMICALS TO ENTER THE SANITARY SEWER SYSTEM? X* YES ☐ NO

***The only potential for spilled chemicals to enter the sanitary sewer system is through the laboratory.**

OR STORM SEWER? X YES ☐ NO

Any uncontained spills outside would go directly to Peak Creek; there is no storm water sewer system per se. Three storm water outfalls are identified in the VPDES permit for the facility. A Storm Water Pollution Prevention Plan is required.

6. ARE EMPLOYEES INFORMED OF THE NEED TO KEEP UNAUTHORIZED CHEMICALS OUT OF THE SANITARY SEWER? X YES ☐ NO

New employee training program and occasional training for all personnel. Records of training are maintained on-site.

7. IF THE INDUSTRY IS SUBJECT TO THE ELECTROPLATING, ELECTRONICS OR METAL FINISHING STANDARDS, AND HAS SUBMITTED A SOLVENT/TOXIC ORGANIC MANAGEMENT PLAN; HAS THERE BEEN ANY CHANGE TO THE CONTENTS AND CONDITIONS OUTLINED BY THE PLAN? ☐ YES ☐ NO **N/A**

F. Pollution Prevention

1. WHO IS RESPONSIBLE FOR POLLUTION PREVENTION AT THE PLANT?

Rhendall Butler, Environmental/Quality Manager

2. DOES THE FACILITY HAVE AN ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)? ☐ YES X NO

3. DESCRIBE THE POLLUTION PREVENTION INITIATIVES IMPLEMENTED DURING THE PAST 2 YEARS

Implemented recycle of waste caustic to be reused in process.

4. WHAT KIND OF ASSISTANCE IS THE COMPANY INTERESTED IN RECEIVING REGARDING THE REDUCTION OF WASTES IT GENERATES?

The facility is aware of the DEQ E2 program. Several DEQ employees were present during the pretreatment inspection to provide pollution prevention assistance in anticipation of pending limitations on sulfates and TDS. A memo outlining discussions about potential options is attached to this inspection report.

For reference, the DEQ Pollution Prevention Web Site address is being provided: http://www.deq.virginia.gov/p2/

G. Records

1. ARE THE PERMITTEE'S RECORDS FOR SAMPLING AND ANALYSIS COMPLETE AND ACCURATE?	X	YES		NO
2. IS THE INDUSTRY ON A COMPLIANCE SCHEDULE FOR THE INSTALLATION OF ANY TECHNOLOGY REQUIRED TO MEET THE APPLICABLE PRETREATMENT STANDARDS?		YES	X	NO

IF SO, NOTE THE PROGRESS OF THE INDUSTRY IN FOLLOWING THIS SCHEDULE: **N/A**

3. ARE RECORDS AVAILABLE FOR AT LEAST THREE (3) YEARS?	X	YES		NO

H. Inspection Notes: Requirements/Recommendations/Comments:

1. **On December 7, 2006, the PFRWTA Board adopted local limits for sulfates and Total Dissolved Solids (TDS. These limits are to be applied initially as a loading by jurisdiction, then, after a nearly three year compliance schedule, as uniform local limits applied to each industrial discharger. The concentration limits become effective on October 21, 2009. The facility should immediately begin to investigate options for coming into compliance with these new limitations. Attached to this report is a memo outlining discussions between DEQ and the facility concerning potential options for achieving compliance.**

AUXILIARY/UTILITY FLOWS

AUXILIARY PROCESS	FREQUENCY OF DISCHARGE	FLOW	ASSOCIATED CHEMICALS	DISCHARGE LOCATION
BOILER BLOWDOWN				
COOLING TOWER BLOWDOWN				
AIR COMPRESSOR COOLING WATER				
AIR COMPRESSOR SYSTEM CONDENSATE				
DEMINERALIZER/ SOFTENER REGENERATION WASTEWATER				
CONTACT COOLING WATER				
NON-CONTACT COOLING WATER				
HOUSEKEEPING/FLOOR WASH WATER				

N/A. Any auxiliary/utility flows are routed to the treatment ponds and are discharged though outfall 001 in accordance with the facility's VPDES Permit (VA0000281).

MATERIAL INVENTORY

Worksheet #2
Completed by: Jeff Van Matre
Title: Environmental Quality Manager
Date: 12/20/94

Material	Purpose/Location	Quantity (units)			Quantity Exposed in Last 3 Years	Likelihood of Contact with storm water. If yes, describe reason.	Past Significant Spill or Leak	
		Used	Produced	Stored			Yes	No
Sodium Hydroxide	Inside Facility	980,000 gal/yr	N/A	22,000 gal	None	None		X
Sulfuric Acid	Inside Facility	5,200 gal/yr	N/A	600 gal	None	None		X
Phosphoric Acid	Inside Facility	18,000 gal/yr	N/A	900 gal	None	None		X
Iron Oxide	Inside Facility	N/A	14.5 mlb/mo	1,400 tons	None	None		X
Cobalt Sulfate	Inside Facility	240 tons/yr	N/A	40,000 lb	None	None		X
Zinc Sulfate	Inside Facility	108 tons/yr	N/A	3,000 lb	None	None		X
Ferrous Sulfate	Under Shelter Some Exposed	18,000 tons/yr	N/A	500 tons/yr	None	Yes, Pump Failure Causing Overflow		X
Powdered Iron	Inside Facility	2,400 tons/yr	N/A	40,000 lb	None	None		X
Cyclohexanone	Under Shelter	500 gal	N/A	55 gal	None	None		X

Approved: [signature] Date: 9/23/96

MATERIAL INVENTORY

Worksheet #2a
Completed by: Jeff Van Matre
Title: Environmental Quality Manager
Date: 12/20/94

Material	Purpose/Location	Quantity (units)			Quantity Exposed in Last 3 Years	Likelihood of Contact with storm water. If yes, describe reason.	Past Significant Spill or Leak	
		Used	Produced	Stored			Yes	No
Toluene	Inside Facility	500 gal	N/A	55 gal	None	None		X
Isopropyl Triisosteapoyl Titanate	Inside Facility	1,900 gal	N/A	200 gal	None	None		X
Isopropyl Tribenzenesulfonty Titanate	Inside Facility	1,300 gal	N/A	200 gal	None	None		X
Methyl Ethyl Keytone	Inside Facility	50 gal	N/A	8 gal	None	None		X
Tetra Hydra Furan	Inside Facility	50 gal	N/A	8 gal	None	None		X
Imidazoline	Inside Facility	385 gal	N/A	110 gal	None	None		X
#2 Fuel Oil	Under Shelter Some Exposed	15,000 gal	N/A	25,000 gal (less than)	None	None		X

Approved: [signature] Date: 9/23/96

POLLUTANT SOURCE IDENTIFICATION

Worksheet #3
Completed by: Jeff Van Matre
Title: Environmental Quality Manager
Date: 12/20/94

Storm Water Pollutant Sources	Existing Management Practices	Description of New BMP Options
1. Ferrous Sulfate Storage Area	Periodic Inspection of Area	Routine (Twice per Shift) Inspection of Area to Insure Pumps Are Operation Properly.
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Approved: [illegible signature] Date: 5/23/96

M E M O R A N D U M

DEPARTMENT OF ENVIRONMENTAL QUALITY
West Central Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Generation of Wastewater from Magnetic Media Production Processes at Nanochemonics Holdings LLC; Reissuance of VPDES Permit No. VA0000281

TO: Permit File

FROM: Becky L. France, Environmental Engineer BLF

DATE: November 22, 1998 (Revised 3/26/08)

According to the 2008 permit application, the raw materials may have trace contaminants of chromium, copper, nickel, and zinc. Incoming raw material, copperas (ferrous sulfate), originating from industrial waste products (pickle liquor and titanium dioxide alloy) is dissolved in water and then purified via pH adjustment with iron powder to facilitate precipitation of impurities. Following flocculation and filtration, the filtrate is collected and recycled into the process. The solids are washed and stored inside in a bin located on a concrete pad and transported periodically to the landfill.

The three basic processes used to produce magnetic oxides include: (1) MIO (Magnetic Iron Oxide) Process which precipitates ferric hydroxide (yellow goethite) for calcination to magnetic ferric/ferrous oxides; (2) Cobalt Adsorption (CA) which uses the precursor from MIO as a raw material and involves precipitation, surface treatment, filtration, annealing, and blending, and; (3) the Magnetite Process, which is a similar process as MIO with different reaction conditions (the calcination process is not used in this process).

The MIO Process involves seeding and growth stages to produce an intermediate product, geothite. The purified copperas is reacted in water with sodium hydroxide. The ferrous hydroxide is oxidized in a reactor in air or oxygen to prepare the particles of ferric hydroxide (goethite) which have a yellow pigmentation. These seeded particles are then grown at temperatures below boiling using iron powder/caustic soda while being digested until the appropriate size is obtained. Following the reaction growth stage, several products require doping treatment (HEIN Process) with cobalt sulfate and zinc sulfate to increase the coercivity. Cobalt becomes insoluble above a pH of 8 S.U. The filtrate from the doping process ranges from 6.8 to 7.5 S.U., so the process water from this operation contains dissolved cobalt.

The resulting cake is then dried and granulated and deposited in bins for MO conversion (calcination and densification). The dried geothite iron particles are next calcinated in one of 22 batch kiln rotary units to produce magnetic ferric/ferrous oxides. The geothite is heated in a rotary kiln to produce a transformed crystal called hematite (alpha Fe_2O_3). The hematite is then reduced to magnetite (Fe_3O_4) (black) using carbon monoxide and hydrogen gas. This magnetite is oxidized using air to maghemite (gamma-Fe_2O_3) (brown). Product from the calcination process is transferred to the milling operation (densification). Dry mixing is conducted to reduce the aggregate size and deaerate entrapped air. Following densification, the product is blended to improve homogeneity. Blended packaged product is stored in the warehouse. All city water is used for the MO conversion process. This water is used as noncontact cooling water for the coolers, kiln, air compressors, and mullers. Recovered cooling water goes to a series of recovery tanks. Water from these tanks is recycled to be reused in the filtration process. Water from the recovery tanks is stored in the Dorr water storage tank (approx. 65,000 gallons). Overflow from this tank is currently not recovered, and the facility plans to install a new larger storage tank to reduce water usage.

The Cobalt Adsorption (CA) Process produces high grade video oxides. This process uses gamma-Fe_2O_3 precursor (maghemite) as the raw material. Cobalt sulfate, caustic soda, water, and ferrous sulfate are added to reactors to form a cobalt ferrite. The solution is then filtered using recessed plate filter presses for washing. After filtration, the product is reslurried in water, surface-treated, and pH adjusted in the surface treatment mixing tank. The product is again filtered and dried in a belt dryer. After drying, the product is low-temperature annealed under a blanket of inerting gas to prevent oxidation. The process is finished with densification and blending. Cobalt is used to raise coercivity for certain products. High cobalt is not an issue from the CA plant due to the high pH of the process water. Spent caustic soda from this process after filtration is stored for reuse in the process.

The Magnetite Process produces materials for copiers and laser printers. The stages of the process are: reaction, filtration, reslurring, secondary filtration, drying, granulation, blending, and drying. The Magnetite process uses caustic soda and ferrous sulfate to form a precipitation product. The process water, generated during filtration and product drying stages, is routed through the onsite wastewater treatment system.

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
West Central Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Site Inspection Report for Magnox Pulaski Incorporated
Reissuance of VPDES Permit No. VA0000281

TO: Permit File

FROM: Becky L. France, Environmental Engineer Senior BLF

CC: Samuel C. Hale, Environmental Inspector Supervisor

DATE: April 20, 2004

On January 14, 2004, I conducted a site visit of the wastewater works at Magnox Pulaski Incorporated. Mr. Rhendal Butler, Environmental Quality Manager, was present at the inspection. Magnox produces synthetic iron oxide pigments for use by the magnetic recording industry and as a component of toners for copy machines and laser printers. Magnetic oxides are produced through three basic processes which include the Magnetic Iron Oxide (MIO) Process, the Cobalt Adsorption (CA) process, and the Magnetite Process as described in the process description memorandum dated November 22,1998. Certain product lines from the MIO process are surface treated with copper sulfate and zinc sulfate in an intermediate process called the HIEN process. Also, the facility can manufacture transparent metallic oxides.

Raw materials include the following main constituents: ferrous sulfate (copperas), caustic soda, powdered metallic iron, and water. In addition, lesser amounts of cobalt sulfate, zinc sulfate, phosphoric acid, sulfuric acid, and sodium chloride are used. The facility is currently in operation 5 days a week. Due to low process water flows, the facility is currently not discharging on the weekend.

Wastewater Treatment

The wastewater treatment system consists of the following: flocculation, sedimentation, carbon dioxide reacidification, and sludge drying.

Precipitation: The wastewater is no longer routinely pretreated with lime prior to the treatment plant. As the waste stream enters the main treatment basin, the pH is adjusted with a lime slurry to between 10.8 S.U. to 11.4 S.U. to insolubilize the metal ions present in the waste stream so that they may be removed by sedimentation in the ponds. Also, a minimum effluent hardness of 95 mg/l is maintained by adding a small constant amount of baseline dosing with lime.

Once the pH and hardness have been stabilized, anionic polymer (Selfloc 2140B) is delivered to the effluent ditch downstream of the pH adjustment pit. After the flocculent is added to the wastewater stream, the wastewater is gravity fed through an 18-inch ditch to a concrete basin covered with grating. At the time of the inspection, this system seemed to be functioning properly.

Sedimentation: Wastewater exits via a ditch to No. 4 clay lined holding pond to separate precipitated solids (iron oxides, iron hydroxides, calcium sulfate, and cobalt) from the wastewater. The wastewater flows in series through the three or two remaining lagoons (No. 3 to No. 2 to No. 1) depending on whether a lagoon is being serviced. At the time of the site visit, the water in Pond No. 4 was greenish-brown in color. Generally solids are cleaned out of the lagoons when the floc covers approximately half the surface area. The wooden boards that had been stacked in the entrance of the discharge flume into the next lagoon have been removed. The wastewater in Pond No. 3, 2, and 1 had a brownish tint. The effluent discharges from Pond No. 1 into Peak Creek through a v-notch weir with a continuous monitoring device.

Carbon Dioxide Reacidification: Final pH is controlled by carbon dioxide addition prior to the final settling pond. Wastewater leaving each of the four ponds is continuously monitored for pH. If the wastewater pH is below 6.0 S.U. in the channel between Pond No. 2 and Pond No. 1, soda ash can be added to raise the effluent pH. In order to adjust the pH to within permit limits, carbon dioxide is added by a series of diffusers within the pipe that carries the effluent from Pond No. 2 to No. 1. Carbon dioxide is supplied by a 30-ton storage tank, and four backup cylinders located at the foot bridge across Peak Creek. Sulfuric acid is also available for emergencies.

A new filtration/clarification/drying plant was proposed in 1993 to replace the settling ponds and drying beds. The mechanical system, which includes a filtration plant, has been abandoned due to inadequate detention time to adequately remove solids.

Sludge Drying: In order to address groundwater concerns, two of the three drying beds were taken out of service. Solids are removed from the ponds to the remaining approved clay lined drying bed for dewatering. This accumulated material is registered as Soilex^R, a landfill cover material. Excess water percolates through an ash bed into a drain tile field bed to expedite the evaporative drying process. Drainage from the bed discharges back to Pond No. 4.

Magnox has an approved engineering plan for installation of a 10,000 sq. foot waste storage pad for temporary storage of sludge from the drying bed. Due to fast sludge drying times, construction of this storage pad has not been necessary. Dried sludge from Drying Bed No. 1 is periodically hauled to the local landfill, New River Solid Waste Management Area in Pulaski or sold to an approved buyer in accordance with solid waste regulations.

Toxicity Problems

In 1997, the facility identified sodium sulfate as the primary cause of toxicity problems. The facility began separating high sulfate process water from the clarifiers and filter presses and routing to Peppers Ferry Regional Wastewater Treatment Facility. Later, toxicity problems were associated with cobalt, solids carryover, and contamination of copperas. Caustic soda for pH adjustment has been discontinued and lime used exclusively for the precipitation process. Also, a small continuous dose of lime was added to the treatment process to increase the hardness and optimize metal removal. The supplier of copperas was required to provide material only from the original source.

Storm Water

The facility has a Storm Water Pollution Prevention Plan (SWPPP) on site. Waste solvents are stored in an area on the east side of the facility and are located on a concrete structure with curbing to prevent any release. Ferrous sulfate and sodium hydroxide are unloaded in areas exposed to storm water. Ferrous sulfate (copperas) from industrial waste products (pickle liquor and titanium dioxide alloy) is unloaded onto a concrete pad. This material is transferred to three-sided roofed concrete bins (also on the concrete pad) to be later purified and used as a raw material for the production of magnetic oxides. The transfer and storage area is concrete with berm swales to contain all storm water that falls in this area. The concrete area is sloped to drain into a double-lined sump which is pumped and redirected into the production process. In the event of pump failure, rainfall in the area could overflow into the paved traffic area and sheet flow toward Peak Creek. In January 2002, facility personnel discovered and repaired a break in a section of concrete down gradient to the copperas storage shed area which may have allowed a discharge of contaminated storm water to Peak Creek. According to the SWPPP, the copperas storage area is inspected twice per shift.

Sodium hydroxide is unloaded from the rail cars in an area exposed to precipitation. A sump is located under the railroad track where the unloading takes place. If a spill occurs in this area it would be captured by the sump and directed to the plant wastewater treatment facility where the pH would be adjusted.

Outfall 901: Storm water from the plant area west of Peak Creek is collected by berms and trenches and directed to the treatment facility and is ultimately discharged through the plant's permitted wastewater outfall (storm water discharge 901). This outfall receives any spills captured by the sump at the sodium hydroxide unloading area and runoff from ferrous sulfate stored in the area and can potentially contain residual sulfuric acid. The pH of this wastewater stream is adjusted before it enters the wastewater treatment area. Water drained from the secondary containment around a no. 2 fuel oil tank is also discharged into the wastewater treatment facility.

Storm Water Outfalls 002, 003, 004: Storm water runoff and roof drainage from the areas east of Peak Creek are collected in a series of underground drains which discharge into Peak Creek through three outfalls. These outfalls are considered substantially identical and are monitored in accordance with the permit on an alternating schedule.

Location of Discharge/ Description of Receiving Waters

Effluent from Pond No. 1 is discharged through a concrete flume into Peak Creek. At the time of the site visit, no visible foam or unusual color was evident in the discharge. Instream flow is measured continuously just downstream from the water intake for the facility. Peak Creek is approximately 60 feet wide just below the water intake for the facility. Peak Creek flows into Claytor Lake which is used for hydroelectric power and recreation.

Location of Nearby Discharges

There are no upstream dischargers. The Radford Water Treatment Plant is the nearest water intake (New River) from the facility.

Attachment D

Facility Discharge Data

- Effluent Data
- Storm Water Data
- 1992 Approval Letter for Substantially Identical Outfalls

Nanochemonics Holdings, LLC
VA0000281

Effluent Ammonia as Nitrogen Data (24 hr composites)
Outfall 001

Date	Concentration (mg/L)
12/18/07	0.85
4/10/2008	0.33
4/30/2008	<0.10
5/2/2008	0.12
5/5/2008	0.62

Facility Name:Nanochemonics Holdings LLC
Permit No:VA0000281

Outfall 001 pH Data

DMR Due Date	Concentration Minimum (S.U.)	Concentration Maximum (S.U.)
10-Aug-04	6.4	8.9
10-Sep-04	6.1	8.6
10-Oct-04	6.3	9.4
10-Nov-04	6.4	8.7
10-Dec-04	6.4	9.1
10-Jan-05	6.4	9.4
10-Feb-05	6.1	8.9
10-Mar-05	6.3	10.3
10-Apr-05	6.2	8.9
10-May-05	6.8	8.4
10-Jun-05	6.5	8.5
10-Jul-05	6.4	9.2
10-Aug-05	6.6	8.7
10-Sep-05	6.2	9.2
10-Oct-05	6.8	9
10-Nov-05	6	9.2
10-Dec-05	6.6	8.9
10-Jan-06	6.3	8.5
10-Feb-06	6.3	9
10-Mar-06	6.2	8.1
10-Apr-06	6.8	8.7
10-May-06	6.6	8.8
10-Jun-06	6.8	8.6
10-Jul-06	6.8	9.1
10-Aug-06	3.7	9.4
10-Sep-06	6.6	8.7
10-Oct-06	6.3	9.1
10-Nov-06	6.5	9.1
10-Dec-06	6.6	8.6
10-Jan-07	6.5	8.1
10-Feb-07	6.6	7.7
10-Mar-07	6.2	8.6
10-Apr-07	6.8	8.9
10-May-07	6.5	9.4
10-Jun-07	6.9	8.4
10-Jul-07	6.9	9
10-Aug-07	6.8	8.4
10-Sep-07	6.4	8.3
10-Oct-07	6.4	8.4
10-Nov-07	6.7	8.7
10-Dec-07	6.1	9.6
10-Jan-08	6.5	8.6
10-Feb-08	6.8	8.5

90th Percentile pH	9.4	S.U.
10th Percentile pH	6.12	S.U.

Nanochemonics Holdings, LLC
VA0000281

Effluent Total Recoverable Copper (Outfall 001)

2004 Reissuance Permit Limits	11 µg/L (monthly average)	16 µg/L (maximum daily)
Monitoring Month	(µg/L)	(µg/L)
Aug-04	<7.6	<7.6
Sep-04	<7.6	<7.6
Oct-04	<7.6	<7.6
Nov-04	<7.6	<7.6
Dec-04	<7.6	<7.6
Jan-05	<7.6	<7.6
Feb-05	<7.6	<7.6
Mar-05	<7.6	<7.6
Apr-05	<7.6	<7.6
May-05	<7.6	<7.6
Jun-05	<7.6	<7.6
Jul-05	<7.6	<7.6
Aug-05	<7.6	<7.6
Sep-05	<7.6	<7.6
Oct-05	<7.6	<7.6
Nov-05	<7.6	<7.6
Dec-05	<7.6	<7.6
Jan-06	<7.6	<7.6
Feb-06	<7.6	<7.6
Mar-06	<7.6	<7.6
Apr-06	<7.6	<7.6
May-06	<7.6	<7.6
Jun-06	<7.6	<7.6
Jul-06	<7.6	<7.6
Aug-06	<7.6	<7.6
Sep-06	<7.6	<7.6
Oct-06	<7.6	<7.6
Nov-06	<7.6	<7.6
Dec-06	<7.6	<7.6
Jan-07	<7.6	<7.6
Feb-07	<7.6	<7.6
Mar-07	<7.6	<7.6
Apr-07	<7.6	<7.6
May-07	<7.6	<7.6
Jun-07	<7.6	<7.6
Jul-07	<7.6	<7.6
Aug-07	<7.6	<7.6
Sep-07	<7.6	<7.6
Oct-07	<7.6	<7.6
Nov-07	<7.6	<7.6
Dec-07	<7.6	<7.6
Jan-08	<7.6	<7.6
Feb-08	<7.6	<7.6

Nanochemonics Holdings, LLC
VA0000281

Effluent Total Recoverable Zinc (Outfall 001)

2004 Reissuance Permit Limits	50 µg/L (monthly average)	160 µg/L (maximum daily)
Monitoring Month	**(µg/L)**	**(µg/L)**
Aug-04	<20	<20
Sep-04	<20	<20
Oct-04	<20	<20
Nov-04	21	21
Dec-04	<20	<20
Jan-05	<20	<20
Feb-05	27	27
Mar-05	<20	<20
Apr-05	<20	<20
May-05	<20	<20
Jun-05	11	11
Jul-05	<20	<20
Aug-05	<20	<20
Sep-05	22	22
Oct-05	<20	<20
Nov-05	<20	<20
Dec-05	<20	<20
Jan-06	<20	<20
Feb-06	<20	<20
Mar-06	<20	<20
Apr-06	<20	<20
May-06	<20	<20
Jun-06	<20	<20
Jul-06	<20	<20
Aug-06	<20	<20
Sep-06	<20	<20
Oct-06	<20	<20
Nov-06	<20	<20
Dec-06	9	9
Jan-07	<20	<20
Feb-07	17	17
Mar-07	17	17
Apr-07	8	8
May-07	31	31
Jun-07	7	7
Jul-07	24	24
Aug-07	18	18
Sep-07	19	19
Oct-07	36	36
Nov-07	**72.3**	72.3
Dec-07	38	50
Jan-08	11	11
Feb-08	15	15

Nanochemonics Holdings, LLC
VA0000281

Effluent Hardness from TMP Results

Date	Hardness (mg/L) (Composite)
09/20/04	110
09/21/04	120
09/22/04	160
09/23/04	160
09/24/04	140
11/15/04	200
11/16/04	170
11/17/04	150
11/18/04	180
11/19/04	170
02/28/05	150
03/01/05	170
03/02/05	140
03/03/05	140
06/20/05	100
06/21/05	92
06/22/05	100
06/23/05	128
06/24/05	116
10/24/05	64
10/25/05	68
10/26/05	100
10/27/05	136
10/28/05	132
11/07/05	120
11/08/05	116
11/09/05	144
11/10/05	204
11/11/05	208
03/27/06	112
03/28/06	112
03/29/06	144
03/30/06	176
03/31/06	160
06/05/06	56
06/06/06	92
06/07/06	116
06/08/06	184
06/19/06	216
09/25/06	68
09/26/06	72
09/27/06	132
09/28/06	152
09/29/06	196
12/14/06	88
12/15/06	84
12/18/06	100
12/19/06	92
03/12/07	124
03/13/07	140
03/14/07	208
03/15/07	236
03/16/07	236
06/12/07	100

Nanochemonics Holdings, LLC
VA0000281

Effluent Hardness from TMP Results

Date	Hardness (mg/L) (Composite)
06/13/07	112
06/14/07	140
06/15/07	156
09/17/07	136
09/19/07	140
09/21/07	152
12/03/07	64
12/04/07	80
12/05/07	104
12/06/07	136
12/07/07	160

mean (mg/L) 135

Outfall Data for Nanochemonics Holdings, LLC
VPDES Permit No. VA0000281

Outfalls 002, 003, 004 (Storm Water - Grab Samples)

Date	Outfall	Zinc, TR (µg/L)	pH (S.U.)	Nitrogen, Total (mg/L)	Aluminum, TR (ug/L)	Iron, TR (mg/L)	Flow (MGD)
(Decision Criteria)		(120 µg/L)	(6-9 S.U.)	(2.2 mg/L)	(750 µg/L)	(1 mg/L)	
9/8/04	002	27					0.00207
11/14/04	003	25					0.00084
4/2/05	004	25					0.0005
7/7/05	002	34	**4.6**	<0.502	<100	0.315	0.0005
9/28/05	003	**1114**					0.00019
12/28/05	004	192					0.00009
3/21/06	002	25					0.00008
6/26/06	003	**2013**	6.0	1.587	<100	<0.10	0.00086
9/28/06	004	84					0.00013
12/21/06	002	55					0.0013
12/21/06	003	44					0.00017
3/28/07	003	57.8					0.00277
6/27/07	004	**2073**	**4.54**	3.0	<QL	0.97	0.0021
6/24/07	002	**520**					0.00031
9/14/07	004	**6220**					0.01007
9/14/07	003	105					0.01007
10/19/07	004	**2390**					0.00009

Outfall 901 (Storm Water - Grab Samples)

	7/7/05	6/26/06	6/27/07	Limits / (Criteria)
Flow (MG)	0.328	0.269	0.036	--
Aluminum, TR (ug/L)	<1	<0.1	0.111	--/(750 µg/L)
Nitrogen, Total (mg/L)	<0.306	<0.665	0.72	--/(2.2 mg/L)
pH (S.U.)	7.24	8.3	7.32	6.0-9.0
Chromium 6 TR (ug/L)	<QL	<0.002	<QL	1500
Copper, TR (ug/L)	<QL	<QL	<QL	16
Iron, TR (mg/L)	0.154	<0.1	0.23	1.0
TSS (mg/L)	4.0	0.5	4.0	45
Temperature (°C)	27.8	26.2	27.1	29.0
Zinc, TR (ug/L)	**1630**	<0.1	**150**	50

11341.11

COMMONWEALTH of VIRGINIA

STATE WATER CONTROL BOARD

Richard N. Burton
Executive Director

P. O. Box 11143
Richmond, Virginia 23230-1143
(804) 527-5000
TDD (804) 527-4261

OCT 14 1992

RECEIVED
OCT 16 1992
OLVER INCORPORATED

Mr. Glen L. Foster
Project Manager
Olver Incorporated
1116 South Main Street
Blacksburg, VA 24060

RE: Petition for Substantially Identical Outfalls
Magnox-Pulaski, Incorporated

Dear Mr. Foster:

Your petition for substantially identical outfalls submitted on behalf of the above referenced facility has been reviewed. Approval has been granted for your request to sample one of the roof drain pipes as being representative of the discharge from the entire roof area. If the existing NPDES permit does not cover storm water discharges at the permitted outfalls, then those outfalls would also need to be sampled and Forms 2F and 2C completed and submitted.

Sincerely,

for Richard N. Burton
Executive Director

OLVER INCORPORATED
Consulting Engineers · Environmental Laboratories
1116 South Main Street Blacksburg, Virginia 24060

September 8, 1992

Mr. Burton R. Tuxford
Virginia Water Control Board
P.O. BOX 11143
Richmond, VA 23230-1143

Re: Storm Water Sampling for Magnox-Pulaski, Incorporated, Job Number 11341.11

Dear Burton:

We are preparing the individual permit application for the storm water permit for the Magnox facility located at 720 Commerce Street in Pulaski, Virginia. We believe that it is appropriate at this facility to only sample two representative outfalls, and request your concurrence on this determination.

The majority of this facility's storm water drains into the process water where it is treated before discharge under an NPDES permit. There is one manufacturing building where the storm water is separate from process and drains to Peak Creek. Here there are several roof drains to several different locations. We ask to sample one of these point sources, knowing that the pollutants here are representative of the whole building.

We appreciate your consideration of this request and look forward to your response in this matter.

Sincerely,

Glen L. Foster
Project Manager

GLF/trb

cc: Mr. Ron Friant, Quality, Technical and Environmental Superintendent, Magnox-Pulaski, Incorporated

Attachment E

Ambient Water Quality Information

- Peak Creek Instream Data (9-PKC011.11)
- Integrated 2004 Water Quality Assessment Summary (Excerpt)
- 2006 Impaired Waters Fact Sheet (Excerpt)
- Fecal Bacteria and General Standard Total Maximum Daily Load Development for Peak Creek (Excerpt)

9-PKC011.11 (Route 610 Bridge - Commerce Street)
Peak Creek; upstream of Nanochemonics outfalls 001, 002, 003, and 004
VAW-N17R

Collection Date Time	Temp Celsius	Do Probe	Field pH (S.U.)	Hardness, Total (mg/L as $CACO_3$)
2/21/1995 13:00	6	13.3	8.9	19
5/4/1995 14:00	13.5	9.6	8.45	27
7/31/1995 13:30	25.6	8	8.7	23
11/1/1995 13:30	14.3	10	7.9	31
2/8/1996 12:00	5	12.8	7.7	16
5/1/1996 13:30	13	9.8	7.8	17
8/1/1996 13:00	21	8.3	8	26
11/4/1996 12:00	7.4	9	8.3	28
2/3/1997 11:30	4.5	9.4	8.8	15.9
5/1/1997 12:30	16	9	8.2	16.9
9/25/1997 11:30	14.6	8.4	7.7	28.4
11/3/1997 11:00	9	8.9	7.5	22.8
2/9/1998 11:30	5.7	12.7	7.6	33.4
5/21/1998 12:00	18.5	8.7	8.1	29.8
8/13/1998 12:30	22	7.7	8.2	32.3
11/4/1998 12:30	10	9.7	7.8	25
2/3/1999 12:00	6.2	11.2	7.8	10
5/3/1999 13:00	14.5	9.4	8.6	14
7/28/1999 14:00	24.5	7.7	8.2	27.7
9/21/1999 14:30	18.5	8.8	8.2	25.8
11/29/1999 14:30	7.4	10.1	8.2	22.7
1/18/2000 14:30	1	11.4	8.5	24.8
3/13/2000 13:00	6.9	10	8.1	17
5/8/2000 14:00	19.5	9	8.4	17
7/26/2000 13:10	19.3	8.6	8.25	30.8
9/19/2000 13:30	18.2	8.1	8.52	25.6
11/29/2000 8:30	2.3	12.3	7.66	19.7
3/8/2001 12:30	5.6	14.3	8.95	6.9
5/17/2001 11:20	15.1	9.41	7.77	15.7
8/19/2003 6:35	19.32	7.92	7.79	
10/27/2003 11:40	12.16	9.64	7.49	
12/22/2003 13:30	5.6	12.5	7.7	
2/18/2004 11:55	3.39	11.42	8.01	
4/21/2004 13:15	15.33	9.62	7.36	
6/22/2004 11:25	19.9	10.47	7.72	
8/25/2004 10:30	20.4	8.58	7.89	
10/27/2004 11:20	13	9.13	7.51	
12/1/2004 12:50	8.63	10.17	7.74	
2/17/2005 11:15	4.91	NULL	8.11	
4/19/2005 11:25	12.36	10.41	8.05	
6/7/2005 12:00	18.9	8.1	7.8	

Mean hardness	22 mg/L	(use 25 mg/L default in WLA spreadsheet)
90th Percentile temperature	20.4 °C	
90th Percentile pH	8.6 S.U.	
10th Percentile pH	7.6 S.U.	

2004 Use Attainment by Assessment Units (AU)

Watershed ID: VAW-N17R

Total Watershed Size: 130.84 M

AU ID: VAW-N17R_ZZZ02A02 — 1.18 M — *AU Overall Category:* 3A

LOCATION: An unnamed tributary to Peak Creek within the WQS designated public water supply (PWS) section.

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Not Assessed	
	Fish Consumption	Not Assessed	
	Public Water Supply	Not Assessed	
	Recreation	Not Assessed	
	Wildlife	Not Assessed	

WQS Class IV Sec. 2m PWS NEW-5 No current data. These waters are not assessed. No VDH fish consumption or drinking water advisories.

AU ID: VAW-N17R_ZZZ01A00 — 59.66 M — *AU Overall Category:* 3A

LOCATION: Tributaries to Peak Creek not within WQS designated public water supply (PWS) sections. These include Thronsprings Branch, and tributaries to Tract Fork .

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Not Assessed	
	Fish Consumption	Not Assessed	
	Recreation	Not Assessed	
	Wildlife	Not Assessed	

WQS Class IV Sec. 2 v NEW-5 No current data. These waters are not assessed. No VDH fish consumption advisory.

AU ID: VAW-N17R_XAG01A02 — 3.14 M — *AU Overall Category:* 2A

LOCATION: An unnamed tributary to Peak Creek not within WQS designated public water supply (PWS) sections. The unnamed tributary mouth is located @37°02'47" / 80°46'03".

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Fully Supporting	
	Fish Consumption	Not Assessed	
	Recreation	Not Assessed	
	Wildlife	Fully Supporting	

WQS Class IV Sec. 2 v,NEW-5
Assessment basis: DEQ station 9-XAG000.25 (AQ) single observations of field parameters are not assessed. 9-XAG000.25- Single observations of FC, DO, Temp, pH & TP; No exceedances- not assessed. Single NH3-N sample- Full Support. No VDH fish consumption advisory.

AU ID: VAW-N17R_TCK03A00 — 5.04 M — *AU Overall Category:* 3A

LOCATION: Tract Fork mainstem from the confluence of Altoona Branch upstream to its headwaters

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Not Assessed	
	Fish Consumption	Not Assessed	
	Recreation	Not Assessed	
	Wildlife	Not Assessed	

2004 Use Attainment by Assessment Units (AU)

WQS Class VI Sec. 2 v NEW-5 No current data. These waters are not assessed. No VDH fish consumption advisory.

AU ID: **VAW-N17R_TCK02A00** **6.68** M *AU Overall Category:* **3A**

LOCATION: Tract Fork mainstem from the confluence of Pondlick Branch upstream to the mouth of Altoona Branch.

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Not Assessed	
	Fish Consumption	Not Assessed	
	Recreation	Not Assessed	
	Wildlife	Not Assessed	

WQS Class IV Sec. 2 v NEW-5 No current data. These waters are not assessed. No VDH fish consumption advisory.

AU ID: **VAW-N17R_TCK01A00** **1.26** M *AU Overall Category:* **3A**

LOCATION: Tract Fork mainstem from its confluence with Peak Creek upstream to the mouth of Pondlick Branch.

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Not Assessed	
	Fish Consumption	Not Assessed	
	Recreation	Not Assessed	
	Wildlife	Not Assessed	

WQS Class IV Sec. 2 v NEW-5 No current data. These waters are not assessed. No VDH fish consumption advisory.

AU ID: **VAW-N17R_PLK01A04** **3.45** M *AU Overall Category:* **2B**

LOCATION: Pondlick Branch from its headwaters downstream to its mouth on Peak Creek.

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Fully Supporting	
	Fish Consumption	Not Assessed	
	Recreation	Not Assessed	
	Wildlife	Not Assessed	

WQS Class IV Sec. 2 v NEW-5
Assessment basis: USFS MAIS stations 8092 and 8093 8092- Bio 'SI'; slight impairment. Single Survey '01 (MAIS score 15 Good). 8093- Bio 'SI'; slight impairment. Single Survey '01 (MAIS score 16 Good).

AU ID: **VAW-N17R_PKC08A04** **5.39** M *AU Overall Category:* **2A**

LOCATION: Peak Creek mainstem headwaters downstream to an unnamed tributary just downstream of the Rt. 712 crossing (37°02'03" / 80°55'13").

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Fully Supporting	
	Fish Consumption	Not Assessed	
	Public Water Supply	Not Assessed	
	Recreation	Not Assessed	
	Wildlife	Not Assessed	

WQS Class VI Sec. 2d PWS,v,NEW-5
Assessment basis: USFS MAIS station 7020. 7020- Bio 'NI'; no impairment. Single Survey '01 (MAIS score 17 Very Good).

2004 Use Attainment by Assessment Units (AU)

AU ID: **VAW-N17R_PKC07A00** **10.30** M *AU Overall Category:* **3A**

LOCATION: These waters are the headwaters of Peak Creek, mainstem and tributaries downstream to Peak Creek's inundation at Gatewood Reservoir.

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Not Assessed	
	Fish Consumption	Not Assessed	
	Public Water Supply	Not Assessed	
	Recreation	Not Assessed	
	Wildlife	Not Assessed	

WQS Class VI Sec. 2d PWS v NEW-5 No current data. These waters are not assessed. No VDH fish consumption or drinking water advisories.

AU ID: **VAW-N17R_PKC06A00** **6.39** M *AU Overall Category:* **3A**

LOCATION: These waters are all immediate tributaries to Gatewood Reservoir excluding Peak Creek upstream to its inundation. All PWS designated waters.

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Not Assessed	
	Fish Consumption	Not Assessed	
	Public Water Supply	Not Assessed	
	Recreation	Not Assessed	
	Wildlife	Not Assessed	

WQS Class IV Sec. 2d PWS v NEW-5 No current data. These waters are not assessed. No VDH fish consumption or drinking water advisories.

AU ID: **VAW-N17R_PKC05A00** **20.91** M *AU Overall Category:* **3A**

LOCATION: This section contains the Hogan Creek free flowing drainage and the remainder of the Peak Creek mainstem and tributaries upstream to Gatewood Reservoir Dam within the PWS designated section.

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Not Assessed	
	Fish Consumption	Not Assessed	
	Public Water Supply	Not Assessed	
	Recreation	Not Assessed	
	Wildlife	Not Assessed	

WQS Class IV Sec. 2d PWS v NEW-5 No current data. These waters are not assessed. No VDH fish consumption or drinking water advisories.

AU ID: **VAW-N17R_PKC04A00** **2.10** M *AU Overall Category:* **2B**

LOCATION: The segment extends from the mouth of Hogan Creek downstream to just above the Magnox. Inc. outfall on Peak Creek.

State TMDL ID	Use	WQS Attainment	303(d) Impairment Initial List Year
	Aquatic Life	Fully Supporting	
	Fish Consumption	Not Assessed	
	Recreation	Fully Supporting	
	Wildlife	Fully Supporting	

2004 Use Attainment by Assessment Units (AU)

WQS Class IV Sec. 2 v NEW-5
Assessment basis: DEQ station 9-PKC011.11 (AQ, RBPII) 9-PKC011.11- Bio 'NI; no impairment. RBP II 5 year score 76.44; 2 year score 100. Both 1999 and
spring 2000 surveys were poor relative to reference conditions; however, rainfall in the watershed was much lower than normal and the reference at that time
(Sinking Creek, 9-SNK012.06), is a stream that does not appear to be very susceptible to drought. In 2002, the reference site for the three Peak Creek
Biomonitoring stations was changed to 9-PKC011.11 since this station has been determined to be minimally impacted relative to the two downstream sites. Instream
habitat scores are mostly in the optimal range. Riparian vegetation is impacted with narrow buffers immediately upstream as a result of residential land use. 9-
PKC011.11- No excursions are found for DO, Temp, pH, TP or NH3-N. One FC observation exceeds the WQS 400 cfu/100 ml instantaneous criterion at 600 from
17 samples- Fully Supporting. AQ sediment exceedances of PEC SVs for lead (Pb) SV of 128 ppm, zinc (Zn) SV of 459 ppm, DDD SV of 28 ppb and DDE SV 31.3
ppb: Metals- 1999 Pb at 420 and Zn at 1520 ppm, 1998 Pb at 220 and Zn at 1080 ppm; Organics- 1999 DDD at 30 and DDE at 40 ppb- 'Observed Effect'. No
VDH fish consumption advisory.

AU ID: **VAW-N17R_PKC03A00** **0.88** M ***AU Overall Category:*** **2B**

LOCATION: This portion of Peak Creek extends from the Magnox, Inc. outfall on down ~0.20 miles downstream of the Washington Ave. Bridge.

State TMDL ID	*Use*	*WQS Attainment*	*303(d) Impairment Initial List Year*
	Aquatic Life	**Fully Supporting**	
	Fish Consumption	**Not Assessed**	
	Recreation	**Fully Supporting**	
	Wildlife	**Fully Supporting**	

WQS Class IV Sec. 2 v NEW-5
Assessment basis: DEQ station 9-PKC011.11 (AQ, RBPII) 9-PKC011.11- Bio 'NI; no impairment. RBP II 5 year score 76.44; 2 year score 100. Both 1999 and
spring 2000 surveys were poor relative to reference conditions; however, rainfall in the watershed was much lower than normal and the reference at that time
(Sinking Creek, 9-SNK012.06), is a stream that does not appear to be very susceptible to drought. In 2002, the reference site for the three Peak Creek
Biomonitoring stations was changed to 9-PKC011.11 since this station has been determined to be minimally impacted relative to the two downstream sites. Instream
habitat scores are mostly in the optimal range. Riparian vegetation is impacted with narrow buffers immediately upstream as a result of residential land use. 9-
PKC011.11- No excursions are found for DO, Temp, pH, TP or NH3-N. One FC observation exceeds the WQS 400 cfu/100 ml instantaneous criterion at 600 from
17 samples- Fully Supporting. AQ sediment exceedances of PEC SVs for lead (Pb) SV of 128 ppm, zinc (Zn) SV of 459 ppm, DDD SV of 28 ppb and DDE SV 31.3
ppb: Metals- 1999 Pb at 420 and Zn at 1520 ppm, 1998 Pb at 220 and Zn at 1080 ppm; Organics- 1999 DDD at 30 and DDE at 40 ppb- 'Observed Effect'. No
VDH fish consumption advisory.

AU ID: **VAW-N17R_PKC02A00** **1.62** M ***AU Overall Category:*** **5A**

LOCATION: The segment begins downstream of the Washington Ave. Bridge (~0.20 miles) and extends on downstream to just below the Rt. 99 Bridge/Norfolk Southern Railway crossing of Peak Creek.

State TMDL ID	*Use*	*WQS Attainment*	*303(d) Impairment Initial List Year*
VAW-N17R-01	**Aquatic Life**	**Not Supporting**	
	303(d) Parameter:	**Benthic-Macroinvertebrate Bioassessments (Streams)**	1996
VAW-N17R-01	**Fish Consumption**	**Not Supporting**	
	303(d) Parameter:	**Polychlorinated biphenyls**	2002
VAW-N17R-01	**Recreation**	**Not Supporting**	
	303(d) Parameter:	**Total Fecal Coliform**	2002
	Wildlife	**Fully Supporting**	

WQS Class IV Sec. 2 v NEW-5
Assessment basis: DEQ stations 9-PKC009.29 (AQ, RBPII), 9-PKC007.82 ('00 FT/Sed) & 9-PKC007.80 (RBPII) 9-PKC009.29- Bio 'MI'; moderate impairment;
RBP II 5 year score 48.15; 2 year score 39.92. BPJ used during many assessments due to the use of metrics not in the RBP II suite such as %Ephemeroptera
(mayflies), % EPT (-Hydropsychidae), and %Chironomidae. The use of additional metrics aided in identifying declines in sensitive taxa relative to the reference
station and the upper Peak Creek station (9-PKC011.11). In 2002, the reference site for the three Peak Creek Biomonitoring stations was changed to 9-PKC011.11
since that station was determined to be minimally impacted relative to the two downstream sites. Habitat in this reach has been impacted by loss of riparian
vegetation and instream cover, and increased sedimentation. 9-PKC009.29- FC exceeds the WQS 400 cfu/100 ml instantaneous criterion in seven of 18
observations. Exceeding values ranged from 700 to 6300 cfu/100 ml. DO, Temp, pH, TP, water column metals and organics all are Fully Supporting. AQ sediment
collections exceed the lead (Pb) PEC SV of 128 ppm and zinc (Zn) PEC SV of 459 ppm in 2000- Pb at 135 and Zn at 1280 ppm; 1999- Zn at 320 ppm; and 1998- Pb
at 130 and Zn at 680 ppm- 'Observed Effect'. 9-PKC007.82- WQS 2000 Fish Tissue - PCB exceeds tissue SV of 54 ppb in Smallmouth Bass @ 71 ppb.
Downstream (9-PKC004.65) Carp exceedance at 150 ppb. Assessed impaired for fish consumption based on proximity of station locations and 2 species. 9-
PKC007.82- WQS 2000 Sediment exceeds PEC SVs for metals- Copper (Cu) PEC SV of 149 at 362 ppm and Zinc (Zn) SV of 459 at 1104 ppm. And organics-
Phenanthrene (PEC SV 1170) at 3049 ppb, Fluoranthene (PEC SV 2230) at 5866 ppb, Pyrene (PEC SV 1520) at 3877 ppb, Benz (a) Anthrecene (PEC SV 1050) at
2047 ppb and Chrysene (PEC SV 1290) at 2133 ppb. Results in 'Observed Effect'. 9-PKC007.80- Bio 'MI'; moderate impairment; RBP II 5 year score 39.65; 2 year
score 53.26. DO, Temp, pH are Fully Supporting. 9-PKC004.65 (located in VAW-N16L)- WQS 2000 fish tissue exceeds PCB SV of 54 ppb in a Carp at 150 ppb.
9-PKC004.65- WQS 2000 sediment exceeds PEC SV for copper (Cu) 149 ppm and zinc (Zn) 459 ppm from two sample collections: Cu at 326 and 327 ppm; Zn at
894 and 886 ppm- 'Observed Effect'. No VDH fish consumption advisory.

2004 Use Attainment by Assessment Units (AU)

AU ID: **VAW-N17R_PKC01A00** **2.84** M *AU Overall Category:* **5A**

LOCATION: This portion of Peak Creek begins just downstream of the Rt. 99/Norfolk Southern crossing extending downstream to the inundation of Peak Creek in Claytor Lake.

State TMDL ID	Use		WQS Attainment	303(d) Impairment Initial List Year
VAW-N17R-01	Aquatic Life		Not Supporting	
		303(d) Parameter:	Benthic-Macroinvertebrate Bioassessments (Streams)	1996
VAW-N17R-01	Fish Consumption		Not Supporting	
		303(d) Parameter:	Polychlorinated biphenyls	2002
VAW-N17R-01	Recreation		Not Supporting	
		303(d) Parameter:	Total Fecal Coliform	2002
	Wildlife		Fully Supporting	

WQS Class IV Sec. 2 v NEW-5
Assessment basis: DEQ stations 9-PKC009.29 (AQ), 9-PKC007.82 ('00 FT/Sed), 9-PKC007.80 (RBPII) & 9-PKC004.65 ('00 FT/Sed) 9-PKC009.29- FC exceeds the WQS 400 cfu/100 ml instantaneous criterion in seven of 18 observations. 9-PKC007.82- WQS 2000 Fish Tissue - PCB exceeds WQS TV of 54 ppb in Smallmouth Bass @ 71 ppb. Downstream (9-PKC004.65) Carp exceedance at 150 ppb. Total of 37 fish representing six species. Assessed impaired for fish consumption based on proximity of station locations and 2 species. No VDH advisory. 9-PKC007.82- WQS 2000 Sediment exceeds PEC SVs for metals- Copper (Cu) PEC SV of 149 at 362 ppm and Zinc (Zn) PEC SV of 459 at 1104 ppm. And organics- Phenanthrene (PEC SV 1170) at 3049 ppb, Fluoranthene (PEC SV 2230) at 5866 ppb, Pyrene (PEC SV 1520) at 3877 ppb, Benz (a) Anthrecene (PEC SV 1050) at 2047 ppb and Chrysene (PEC SV 1290) at 2133 ppb. Excursions result in an 'Observed Effect'. 9-PKC007.80- Bio 'MI'; moderate imapirment RBP II 5 year score 39.65; 2 year score 53.26. BPJ was used during many assessments due to the use of metrics not in the RBP II suite such as %Ephemeroptera (mayflies), % EPT (-Hydropsychidae), and %Chironomidae. The use of additional metrics aided in identifying declines in sensitive taxa relative to the reference station and the upper Peak Creek station (9-PKC011.11). In 2002, the reference site for the three Peak Creek Biomonitoring stations was changed to 9-PKC011.11 since that station was determined to be minimally impacted relative to the two downstream sites. Additionally, habitat in this reach has been impacted by the loss of riparian vegetation. DO, Temp, pH are Fully Supporting. 9-PKC004.65 (located in VAW-N16L) WQS 2000 fish tissue exceeds WQS PCB TV of 54 ppb in a Carp at 150 ppb. WQS 2000 Sediment exceeds PEC SV for copper (Cu) SV 149 ppm and zinc (Zn) SV 459 ppm from two sample collections: Cu at 326 and 327 ppm; Zn at 894 and 886 ppm- 'Observed Effect'. No VDH fish consumption advisory.

2006 Impaired Waters

Categories 4 and 5 by Impaired Area ID

New River Basin

Cause Group ID: **N17L-01-DO** **Gatewood Reservoir (Peak Creek)**

2006 TMDL Group Codes: 50029

Location: Gatewood Reservoir from its impounding structure to its backwaters.

City / County: Pulaski Co

Use(s): Aquatic Life

Cause(s) / VA Category: Oxygen, Dissolved / 4C

Dissolved oxygen in the bottom layer of the reservoir exceeds the 4.0 mg/l minimum criterion for Class IV waters. Exceedences occur in the late spring, summer and early fall. Dissolved oxygen depletion below the thermocline is a natural occurrence in reservoirs. Water Quality Standards do not specifically address the maintenance of dissolved oxygen levels (stratification) in a reservoir bottom layer. The minimum criterion, based on Class of water, applies to all waters in the Commonwealth.

The Carlson Trophic State Index (TSI) is used to determine the cause of the dissolved oxygen impairment eg. natural or anthropogenic in nature. The following are the index scores from four stations where CA = chlorophyll (a), TP = total phosphorus and SD = seechi disk (transparancy).

TSI scores below 60 indicate a natural aging process in the reservoir while above 60 indicates man's activities on the land may be influencing the natural aging of the reservoir. The data below, primarily SD, indicates a natural aging process for Gatewood Reservoir- Category 4C.

Peak Creek:
9-PKC017.71 (Gatewood Res. Large Arm) (TSI): CA [36.7] TP [39.3] SD [45.6].
9-PKC016.91 (Gatewood Res. Dam) (TSI): CA [37.2] TP [39.6] SD [44.0].

Assessment Unit / Water Name / Description	Cause Category / Name	Cycle First Listed	TMDL Schedule	Size
VAW-N17L_PKC01A02 / Gatewood Reservoir / Gatewood Reservoir from its impounding structure to its backwaters.	4C Oxygen, Dissolved	2006		176.15

Gatewood Reservoir (Peak Creek)	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Oxygen, Dissolved - Total Impaired Size by Water Type:		176.15	

Sources:

Natural Conditions - Water Quality Standards Use Attainability Analyses Needed

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

2006 Impaired Waters

Categories 4 and 5 by Impaired Area ID

New River Basin

Cause Group ID: **N17R-01-BAC** **Peak Creek and Claytor Lake (Peak Creek Arm upper portion)**

2006 TMDL Group Codes: 00021 50295 50296

Location: The bacteria impairment extends upstream to approximately 0.2 miles downstream of the Washington Avenue Bridge in Pulaski. The impairment ends in the upper portion of Claytor Lake (Peak Creek Arm) at the beginning of the WQS PWS designation (Dublin Quad).

City / County: Pulaski Co

Use(s): Recreation

Cause(s) / VA Category: Escherichia coli / 4A Escherichia coli / 5A Fecal Coliform / 4A

The Peak Creek Bacteria TMDL Study and allocations is complete with US EPA approval on 8/30/2004 [Fed. ID 7824] and SWCB approval on 12/02/2004. The waters are initially 303(d) Listed with the 2002 Assessment for fecal coliform bacteria and extended 0.39 miles with the 2006 IR. The TMDL Study can be viewed at http://www.deq.virginia.gov. The Bacteria TMDL Study did not specifically address that portion of Peak Creek within Claytor Lake (77.74 acres). Future Assessments and 303(d) Listings will replace fecal coliform bacteria with Escherichia coli (E.coli) bacteria as the indicator with sufficient E.coli data as per Water Quality Standards [9 VAC 25-260-170. Bacteria; other waters].

9-PKC011.11 (Commerce St. Bridge) Two FC observations exceed the WQS 400 cfu/100 ml instantaneous criterion at 900 and 1700 from 15 samples. FC remains as 12 or more E.coli collections have not been made. E.coli results find two of seven samples in excess of the 235 cfu/100 ml criterion. Both exceedences are 500 and 640 cfu/100 ml.

9-PKC009.29 (Near Radio Tower) E.coli exceeds the instantaneous criterion in 11 of 18 samples. Exceeding values range from 240 cfu/100 ml. to 10,000.

9-PKC004.65 (Route 100 Bridge) Two of nine E.coli bacteria counts exceed the 235 cfu/100 ml instantaneous criterion. Values in excess of the criterion are 250 and 300 cfu/100 ml.

Assessment Unit / Water Name / Description	Cause Category / Name	Cycle First Listed	TMDL Schedule	Size
VAW-N17R_PKC01A00 / Peak Creek Lower / This portion of Peak Creek begins just downstream of the Rt. 99/Norfolk Southern crossing extending downstream to the inundation of Peak Creek in Claytor Lake.	4A Escherichia coli	2002	2004	2.84
VAW-N17R_PKC02A00 / Peak Creek Middle 1 / The segment begins downstream of the Washington Ave. Bridge (~0.20 miles) and extends on downstream to just below the Rt. 99 Bridge/Norfolk Southern Railway crossing of Peak Creek.	4A Escherichia coli	2006	2004	1.62
VAW-N17R_PKC03A00 / Peak Creek Middle 2 / This portion of Peak Creek extends from the mouth of Tract Fork to downstream of the Washington Ave. Bridge (~0.20 miles).	4A Escherichia coli	2006	2004	0.49
VAW-N17R_PKC03A06 / Peak Creek Middle 3 / This portion of Peak Creek extends from the Magnox, Inc. outfall on downstream to the mouth of Tract Fork.	4A Escherichia coli	2006	2004	0.39
VAW-N17R_PKC04A00 / Peak Creek Upper / The segment extends from the mouth of Hogan Creek downstream to just above the Magnox. Inc. outfall on Peak Creek.	4A Escherichia coli	2006	2004	2.10

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

2006 Impaired Waters

Categories 4 and 5 by Impaired Area ID

New River Basin

Assessment Unit / Water Name / Description	Cause Category / Name	Cycle First Listed	TMDL Schedule	Size
Peak Creek and Claytor Lake (Peak Creek Arm upper portion)		Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Escherichia coli - Total Impaired Size by Water Type:				7.44

Assessment Unit / Water Name / Description	Cause Category / Name	Cycle First Listed	TMDL Schedule	Size
VAW-N17R_PKC03A06 / Peak Creek Middle 3 / This portion of Peak Creek extends from the Magnox, Inc. outfall on downstream to the mouth of Tract Fork.	4A Fecal Coliform	2006	2004	0.39
VAW-N17R_PKC04A00 / Peak Creek Upper / The segment extends from the mouth of Hogan Creek downstream to just above the Magnox. Inc. outfall on Peak Creek.	4A Fecal Coliform	2006	2004	2.10
Peak Creek and Claytor Lake (Peak Creek Arm upper portion)		Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Fecal Coliform - Total Impaired Size by Water Type:				2.49

Sources:

Livestock (Grazing or Feeding Operations)	Municipal (Urbanized High Density Area)	On-site Treatment Systems (Septic Systems and Similar Decencentralized Systems)	Sanitary Sewer Overflows (Collection System Failures)
Unspecified Domestic Waste	Wastes from Pets	Wildlife Other than Waterfowl	

2006 Impaired Waters

Categories 4 and 5 by Impaired Area ID

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

New River Basin

Cause Group ID: **N17R-01-BEN** **Peak Creek**

2006 TMDL Group Codes: 00154

Location: Benthic impaired waters begin downstream of the Washington Ave. Bridge (~0.20 miles) on downstream to the inundation of Peak Creek in Claytor Lake.

City / County: Pulaski Co

Use(s): Aquatic Life

Cause(s) / VA Category: Benthic-Macroinvertebrate Bioassessments (Streams) / 4A

The Peak Creek General Standard - Benthic (Metals) TMDL Study and allocations are complete with US EPA approval on 8/30/2004 [Fed. ID 7823/7822] and SWCB approval on 12/02/2004. The TMDL Study finds cooper (Cu) and zinc (Zn) stressors to benthic community.

9-PKC009.29 (Near Radio Tower) Bio 'MI'; remains moderately impaired; Four RBP II surveys scoring; 2000 spring- 60.87; 2002- spring 47.28, fall- 36.36 & 2003- spring 100) . BPJ used during many assessments due to the use of metrics not in the RBP II suite such as %Ephemeroptera (mayflies), % EPT (-Hydropsychidae), and %Chironomidae. The use of additional metrics aided in identifying declines in sensitive taxa relative to the reference station and the upper Peak Creek station (9-PKC011.11).

9-PKC007.80 (Rt. 99 Bridge) Bio 'MI'; moderate impairment; Four RBP II surveys scoring; 2000 spring- 17.39; 2002 spring- 56.52 fall- 50.0 and 2003 spring- 76.19.

Assessment Unit / Water Name / Description	Cause Category / Name		Cycle First Listed	TMDL Schedule	Size
VAW-N17R_PKC01A00 / Peak Creek Lower / This portion of Peak Creek begins just downstream of the Rt. 99/Norfolk Southern crossing extending downstream to the inundation of Peak Creek in Claytor Lake.	4A	Benthic-Macroinvertebrate Bioassessments (Streams)	1996	2004	2.84
VAW-N17R_PKC02A00 / Peak Creek Middle 1 / The segment begins downstream of the Washington Ave. Bridge (~0.20 miles) and extends on downstream to just below the Rt. 99 Bridge/Norfolk Southern Railway crossing of Peak Creek.	4A	Benthic-Macroinvertebrate Bioassessments (Streams)	1996	2004	1.62

Peak Creek	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Benthic-Macroinvertebrate Bioassessments (Streams) - Total Impaired Size by Water Type:			4.46

Sources:

Contaminated Sediments	Industrial/Commercial Site Stormwater Discharge (Permittted)	Sediment Resuspension (Contaminated Sediment)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

2006 Impaired Waters

Categories 4 and 5 by Impaired Area ID

New River Basin

Cause Group ID: **N17R-01-CU** **Peak Creek**

2006 TMDL Group Codes: 40020

Location: Impairment begins downstream of the Washington Ave. Bridge (~0.20 miles) on downstream to the inundation of Peak Creek in Claytor Lake.

City / County: Pulaski Co

Use(s): Aquatic Life

Cause(s) / VA Category: Copper / 4A

The Peak Creek General Standard - Benthic (Metals) TMDL Study and allocations are complete with US EPA approval on 8/30/2004 [Fed. ID 7823/7822] and SWCB approval on 12/02/2004.

The TMDL Study finds cooper (Cu) and zinc (Zn) stressors to benthic community. The likelihood of dissolved metals reaching acute levels of toxicity in the water column during low-flow and storm events was assessed. The impact of point source discharges of Cu and Zn during low flow was analyzed and it was determined that the concentrations of Cu and Zn would not likely approach the acute criteria for aquatic life (i.e., 13 µg/l and 120 µg/l for Cu and Zn, respectively). It was anticipated that acidic runoff from historic industrial sites may leach significant levels of dissolved Cu and Zn to the stream during storm events. The weight of evidence at this time, including site observations and collected data, points to soils at or from the Allied Signal site as the main source of contamination.

Assessment Unit / Water Name / Description	Cause Category / Name		Cycle First Listed	TMDL Schedule	Size
VAW-N17R_PKC01A00 / Peak Creek Lower / This portion of Peak Creek begins just downstream of the Rt. 99/Norfolk Southern crossing extending downstream to the inundation of Peak Creek in Claytor Lake.	4A	Copper	2006	2004	2.84
VAW-N17R_PKC02A00 / Peak Creek Middle 1 / The segment begins downstream of the Washington Ave. Bridge (~0.20 miles) and extends on downstream to just below the Rt. 99 Bridge/Norfolk Southern Railway crossing of Peak Creek.	4A	Copper	2006	2004	1.62

Peak Creek	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Copper - Total Impaired Size by Water Type:			4.46

Sources:

Contaminated Sediments

Industrial/Commercial Site Stormwater Discharge (Permittted)

Sediment Resuspension (Contaminated Sediment)

2006 Impaired Waters

Categories 4 and 5 by Impaired Area ID

New River Basin

Cause Group ID: **N17R-01-ZN** **Peak Creek**

2006 TMDL Group Codes: 50049

Location: Impairment begins downstream of the Washington Ave. Bridge (~0.20 miles) on downstream to the inundation of Peak Creek in Claytor Lake.

City / County: Pulaski Co

Use(s): Aquatic Life

Cause(s) / VA Category: Zinc / 4A

The Peak Creek General Standard - Benthic (Metals) TMDL Study and allocations are complete with US EPA approval on 8/30/2004 [Fed. ID 7823/7822] and SWCB approval on 12/02/2004.

The TMDL Study finds cooper (Cu) and zinc (Zn) stressors to benthic community. The likelihood of dissolved metals reaching acute levels of toxicity in the water column during low-flow and storm events was assessed. The impact of point source discharges of Cu and Zn during low flow was analyzed and it was determined that the concentrations of Cu and Zn would not likely approach the acute criteria for aquatic life (i.e., 13 µg/l and 120 µg/l for Cu and Zn, respectively). It was anticipated that acidic runoff from historic industrial sites may leach significant levels of dissolved Cu and Zn to the stream during storm events. The weight of evidence at this time, including site observations and collected data, points to soils at or from the Allied Signal site as the main source of contamination.

Assessment Unit / Water Name / Description	Cause Category / Name		Cycle First Listed	TMDL Schedule	Size
VAW-N17R_PKC01A00 / Peak Creek Lower / This portion of Peak Creek begins just downstream of the Rt. 99/Norfolk Southern crossing extending downstream to the inundation of Peak Creek in Claytor Lake.	4A	Zinc	2006	2004	2.84
VAW-N17R_PKC02A00 / Peak Creek Middle 1 / The segment begins downstream of the Washington Ave. Bridge (~0.20 miles) and extends on downstream to just below the Rt. 99 Bridge/Norfolk Southern Railway crossing of Peak Creek.	4A	Zinc	2006	2004	1.62

Peak Creek	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Zinc - Total Impaired Size by Water Type:			4.46

Sources:

Contaminated Sediments

Industrial/Commercial Site Stormwater Discharge (Permittted)

Sediment Resuspension (Contaminated Sediment)

2006 Impaired Waters

Categories 4 and 5 by Impaired Area ID

New River Basin

Cause Group ID: **N29R-01-PCB** **New River, Claytor Lake, Peak Creek and Reed Creek**

2006 TMDL Group Codes: 30001

Location: The impairment begins at the I-77 bridge crossing the New River and extends downstream to the VA/WVA State Line and includes the tributaries Peak Creek and Reed Creek as described below.

Note: The original VDH Advisory issued 8/06/01 extends from Claytor Dam (modified 8/06/03) on the New River on downstream to the VA / WVA State Line. The original VDH Advisory spans the Radford North, Eggleston, Pearisburg, Narrows and Peterstown, WVA Quads.
The expansion of the VDH Advisory issued 12/13/2004 extends from the the I-77 bridge (Wythe County) downstream to Claytor Dam to include the tributaries Peak Creek upstream to the confluence with North Fork Peak Creek (Tract Fork) in Pulaski. And Reed Creek upstream to the confluence with Miller Creek near Rt. 121 bridge near Max Meadows.

City / County: Giles Co Montgomery Cc Pulaski Co Radford City

Use(s): Fish Consumption

Cause(s) /
VA Category: PCB in Fish Tissue / 5A PCB in Fish Tissue / 5D

The Virginia Department of Health (VDH) issued a fish consumption advisory on August 6, 2001 for polychlorinated biphenyls (PCBs) for the lower portion of the New River (Rt. 114 Bridge downstream to the VA / WVA State Line -52.08 miles) based on fish tissue collections from Carp. An Advisory extension on 8/06/2003 to Claytor dam on 8/06/2003 (11.51 miles) reccommends that no carp be consumed in these waters and no more than two meals per month of flathead and channel catfish. The VDH PCB Fish Consumption Advisory was further extended upstream on the New River (__ miles) to the I-77 Bridge to include the lower portions of Peak Creek (4.95 miles), Reed Creek (__ miles) and Claytor Lake (4,287 acres) on 12/02/2004. The VDH advises consumption should not exceed two meals per month for carp and smallmouth bass. The VDH level of concern is 50 parts per billion (ppb) in fish tissue.

There are eight fish tissue collection sites within the 2006 data window reporting exceedences of the WQS based 54 ppb fish tissue value (TV). These data are reviewed by the VDH in making an advisory determination. A complete listing of collection sites and associated fish tissue data are available at http://www.deq.virginia.gov/fishtissue/fishtissue.html. A more detailed presentation of the data can also be found using an interactive mapping application at http://gisweb.deq.state.va.us/. The VDH Advisory information is also available via the web at http://www.vdh.virginia.gov/Epidemiology/PublicHealthToxicology/Advisories/.

Assessment Unit / Water Name / Description	Cause Category / Name	Cycle First Listed	TMDL Schedule	Size
VAW-N17R_PKC01A00 / Peak Creek Lower / This portion of Peak Creek begins just downstream of the Rt. 99/Norfolk Southern crossing extending downstream to the inundation of Peak Creek in Claytor Lake.	5D PCB in Fish Tissue	2002	2014	2.84
VAW-N17R_PKC02A00 / Peak Creek Middle 1 / The segment begins downstream of the Washington Ave. Bridge (~0.20 miles) and extends on downstream to just below the Rt. 99 Bridge/Norfolk Southern Railway crossing of Peak Creek.	5D PCB in Fish Tissue	2002	2014	1.62
VAW-N17R_PKC03A00 / Peak Creek Middle 2 / This portion of Peak Creek extends from the mouth of Tract Fork to downstream of the Washington Ave. Bridge (~0.20 miles).	5D PCB in Fish Tissue	2006	2014	0.49

New River Basin

New River, Claytor Lake, Peak Creek and Reed Creek

	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
PCB in Fish Tissue - Total Impaired Size by Water Type:			4.95

Sources:

Source Unknown

France,Becky

From: Dail,Mary
Sent: Friday, October 10, 2008 10:41 AM
To: France,Becky
Cc: Foster,Kip
Subject: FW: FW: nano permit

Becky –
I apologize for not getting you on the email to Elleanore. Below is the response from Maptech. Please let me know if you have questions.
Thanks,
Mary

From: Dail,Mary
Sent: Friday, October 10, 2008 10:39 AM
To: Daub,Elleanore
Cc: Foster,Kip; Hill,Jason
Subject: FW: FW: nano permit

Hi Elleanore -
Please let me know if this addresses your question.
Thanks,
Mary

From: James Kern [mailto:jkern@maptech-inc.com]
Sent: Thursday, October 09, 2008 12:52 PM
To: Dail,Mary
Subject: Re: FW: nano permit

Mary,

I've been digging through my notes/records, and here's what I came up with. It's not entirely straight forward.

Magnox (Nano) discharges a combination of process water and stormwater. The design flow can be as high as 1.5 MGD, but is limited to 45% of the flow in Peak Creek. So, we used an average monitored discharge of 0.84 MGD. Based on our modeling, we estimated that, on average, 0.3 MGD of that flow were from stormwater. For the process water, we used the remaining 0.81 MGD and permit limits of 11 ug/L Cu and 50 ug/L Zn. This is the bulk of the load allocated to Magnox (see Table 9.2 of the document, reproduced below). The stormwater load was calculated from a combination of concentrations expected from pervious (sediment producing) and impervious urban areas, and the runoff volumes modeled. The annual loads were then rounded to kilograms. Hope that helps. Let me know if you have questions. - Jim

Pollutant Source	Cu Reduction	Cu	Zn Reduction	Zn

		(g/yr)		(g/yr)
Segment 1 (Reference)				
Background	0%	28,916	0%	339,476
Resulting Concentration (mg/kg)		**50**		**587**
Segment 2				
Background	40%	31,508	0%	253,956
Urban Stormwater	40%	21,936	0%	193,851
Allied Signal Stormwater	99%	564	83%	238,956
Magnox Process Water	0%	12,322	0%	56,008
Magnox Stormwater	0%	141	0%	957
Resulting Concentration (mg/kg)		**40**		**453**
Segment 3				
Background	40%	4,900	0%	31,566
Urban Stormwater	40%	12,214	0%	107,939
Allied Signal Stormwater	99%	24,593	83%	346,059
Resulting Concentration (mg/kg)		**50**		**577**
Segment 4				
Background	0%	55,093	0%	127,138
Urban Stormwater	0%	25,832	0%	136,968
Resulting Concentration (mg/kg)		**45**		**375**

Dail,Mary wrote:
Jim – Can you or someone from Maptech help us find the answer to Elleanore's question?
Thanks!
Mary

From: Foster,Kip
Sent: Thursday, October 09, 2008 7:05 AM
To: Dail,Mary; Hill,Jason
Cc: Daub,Elleanore
Subject: FW: nano permit

Can either of you answer Elleanore's question?

Kip Foster
WCRO Water Permit Manager
540-562-6782

From: Daub,Elleanore
Sent: Wednesday, October 08, 2008 3:26 PM
To: Foster,Kip
Subject: nano permit

Kip – what flow and concentration did they use to come up with those Magnox (Nano..something) TMDL loads? I can't find that in the TMDL just the final loads which I can't re-create with the figures I see.

Elleanore M. Daub
DEQ
Office of Water Permit and Compliance Assistance
629 East Main Street
Richmond VA 23219
(804)698-4111 Work
(804)698-4032 Fax

--

James Kern, Ph.D.
Chief Operations Officer - Environmental Scientist
MapTech, Inc.
3154 State Street
Blacksburg, VA 24060

Phone: (540)961-7864 x404
Fax: (540)961-6392
E-mail: jkern@maptech-inc.com
Web: www.maptech-inc.com

Fecal Bacteria and General Standard Total Maximum Daily Load Development for Peak Creek

Prepared for:
Virginia Department of Environmental Quality

Submitted
April 27, 2004

Revised
August 9, 2004

By:
MapTech, Inc.
1715 Pratt Drive, Suite 3200
Blacksburg, VA 24060
Phone: (540) 961-7864, Fax: (540) 961-6392

New River-Highlands
Resource Conservation and Development Area
100 USDA Drive, Suite F
Wytheville, VA 24382

MapTech

New River-Highlands
RC&D

Table ES.3 Allocation scenario 2, focusing on load reductions from the Allied Signal site and a combination of urban stormwater and background loads.

Pollutant Source	Cu Reduction	Cu (g/yr)	Zn Reduction	Zn (g/y)
Segment 1 (Reference)				
Background	0%	28,916	0%	339,476
Resulting Concentration (mg/kg)		**50**		**587**
Segment 2				
Background	40%	31,508	0%	253,956
Urban Stormwater	40%	21,936	0%	193,851
Allied Signal Stormwater	99%	564	83%	238,956
Magnox Process Water	0%	12,322	0%	56,008
Magnox Stormwater	0%	141	0%	957
Resulting Concentration (mg/kg)		**40**		**453**
Segment 3				
Background	40%	4,900	0%	31,566
Urban Stormwater	40%	12,214	0%	107,939
Allied Signal Stormwater	99%	24,593	83%	346,059
Resulting Concentration (mg/kg)		**50**		**577**
Segment 4				
Background	0%	55,093	0%	127,138
Urban Stormwater	0%	25,832	0%	136,968
Resulting Concentration (mg/kg)		**45**		**375**

Implementation

The goal of the TMDL program is to establish a three-step path that will lead to attainment of water quality standards. The first step in the process is to develop TMDLs that will result in meeting water quality standards. This report represents the culmination of that effort for the bacteria and General Standard (benthic) impairments on Peak Creek. The second step is to develop a TMDL implementation plan. The final step is to implement the TMDL implementation plan, and to monitor stream water quality to determine if water quality standards are being attained.

Once EPA has approved a TMDL, measures must be taken to reduce pollution levels in the stream. These measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), are implemented in an

9. ALLOCATIONS

For modeling allocations, loads from permitted sources were adjusted to permitted levels. Reductions were then made to the loads from specific sources, starting with the Allied Signal site and including additional sites as warranted. Two allocation scenarios are presented here. The targeted value for Zn can be achieved through an 83% reduction in the load from the Allied Signal site. For Cu, the first scenario focuses on reductions from the Allied site and urban stormwater (Table 9.1). This scenario includes a 99% reduction from the Allied Signal site and an 83% reduction in loads associated with urban stormwater. The second scenario distributes the reduction in Cu loads between the Allied Signal site, urban stormwater, and background sources (Table 9.2). This scenario is potentially more achievable because it calls for only a 40% reduction of the loads from urban stormwater and background sources.

Table 9.1 Allocation scenario 1, focusing on load reductions from the Allied Signal site and urban stormwater.

Pollutant Source	Cu Reduction	Cu (g/yr)	Zn Reduction	Zn (g/yr)
Segment 1 (Reference)				
Background	0%	28,916	0%	339,476
Resulting Concentration (mg/kg)		**50**		**587**
Segment 2				
Background	0%	52,514	0%	253,956
Urban Stormwater	83%	6,215	0%	193,851
Allied Signal Stormwater	99%	564	83%	238,956
Magnox Process Water	0%	12,322	0%	56,008
Magnox Stormwater	0%	141	0%	957
Resulting Concentration (mg/kg)		**42**		**453**
Segment 3				
Background	0%	8,166	0%	31,566
Urban Stormwater	83%	3,461	0%	107,939
Allied Signal Stormwater	99%	24,593	83%	346,059
Resulting Concentration (mg/kg)		**50**		**577**
Segment 4				
Background	0%	55,093	0%	127,138
Urban Stormwater	0%	25,832	0%	136,968
Resulting Concentration (mg/kg)		**45**		**375**

Table 9.2 Allocation scenario 2, focusing on load reductions from the Allied Signal site and a combination of urban stormwater and background loads.

Pollutant Source	Cu Reduction	Cu (g/yr)	Zn Reduction	Zn (g/yr)
Segment 1 (Reference)				
Background	0%	28,916	0%	339,476
Resulting Concentration (mg/kg)		**50**		**587**
Segment 2				
Background	40%	31,508	0%	253,956
Urban Stormwater	40%	21,936	0%	193,851
Allied Signal Stormwater	99%	564	83%	238,956
Magnox Process Water	0%	12,322	0%	56,008
Magnox Stormwater	0%	141	0%	957
Resulting Concentration (mg/kg)		**40**		**453**
Segment 3				
Background	40%	4,900	0%	31,566
Urban Stormwater	40%	12,214	0%	107,939
Allied Signal Stormwater	99%	24,593	83%	346,059
Resulting Concentration (mg/kg)		**50**		**577**
Segment 4				
Background	0%	55,093	0%	127,138
Urban Stormwater	0%	25,832	0%	136,968
Resulting Concentration (mg/kg)		**45**		**375**

The final TMDL is presented in Table 9.3 as 12 kg/year and 218 kg/year for Cu and Zn, respectively. Of these TMDLs, the remaining loads from the Allied Signal site are allocated at 25 kg/year and 585 kg/year for Cu and Zn, respectively.

Table 9.3 Average annual Cu and Zn loads (kg/year) modeled based on TMDL in the Peak Creek watershed.

Impairment*	WLA (kg/year)	LA (kg/year)	MOS	TMDL (kg/year)
Peak Creek (Cu)	12.7	206	*Implicit*	218.7
VA0000281 – Magnox	*12.0*			
VAR050772 – McCready	*0.6*			
VAR520118 – Gem City	*0.1*			
Peak Creek (Zn)	57.6	1,776		1,833.6
VA0000281 – Magnox	*57.0*			
VAR050772 – McCready	*0.6*			

* The WLAs for affected permits are detailed in this table.

Table ES.3 Allocation scenario 2, focusing on load reductions from the Allied Signal site and a combination of urban stormwater and background loads.

Pollutant Source	Cu Reduction	Cu (g/yr)	Zn Reduction	Zn (g/y)
Segment 1 (Reference)				
Background	0%	28,916	0%	339,476
Resulting Concentration (mg/kg)		**50**		**587**
Segment 2				
Background	40%	31,508	0%	253,956
Urban Stormwater	40%	21,936	0%	193,851
Allied Signal Stormwater	99%	564	83%	238,956
Magnox Process Water	0%	12,322	0%	56,008
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Resulting Concentration (mg/kg)		**40**		**453**
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Segment 4				
Background	0%	55,093	0%	127,138
Urban Stormwater	0%	25,832	0%	136,968
Resulting Concentration (mg/kg)		**45**		**375**

Implementation

The goal of the TMDL program is to establish a three-step path that will lead to attainment of water quality standards. The first step in the process is to develop TMDLs that will result in meeting water quality standards. This report represents the culmination of that effort for the bacteria and General Standard (benthic) impairments on Peak Creek. The second step is to develop a TMDL implementation plan. The final step is to implement the TMDL implementation plan, and to monitor stream water quality to determine if water quality standards are being attained.

Once EPA has approved a TMDL, measures must be taken to reduce pollution levels in the stream. These measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), are implemented in an

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Mr. Alan Pollock, Acting Director
Division of Water Quality Programs
Virginia Department of Environmental Quality
629 Main Street
Richmond, VA 23219

Dear Mr. Pollock:

The United States Environmental Protection Agency (EPA) Region III is pleased to approve the Total Maximum Daily Loads (TMDLs) for the primary contact and aquatic life (benthic) use impairments on Peak Creek. The TMDLs were submitted to EPA for review in April 2004. The TMDLs were established and submitted in accordance with Section 303(d)(1)(c) and (2) of the Clean Water Act to address an impairment of water quality as identified in Virginia's 1996 Section 303(d) list.

In accordance with Federal regulations at 40 CFR §130.7, a TMDL must comply with the following requirements: (1) designed to attain and maintain the applicable water quality standards, (2) include a total allowable loading and as appropriate, wasteload allocations (WLAs) for point sources and load allocations for nonpoint sources, (3) consider the impacts of background pollutant contributions, (4) take critical stream conditions into account (the conditions when water quality is most likely to be violated), (5) consider seasonal variations, (6) include a margin of safety (which accounts for uncertainties in the relationship between pollutant loads and instream water quality), (7) consider reasonable assurance that the TMDL can be met, and (8) be subject to public participation. The enclosure to this letter describes how the TMDLs for the aquatic life and primary contact use impairments satisfy each of these requirements.

Following the approval of these TMDLs, Virginia shall incorporate the TMDLs into an appropriate Water Quality Management Plan pursuant to 40 CFR § 130.7(d)(2). As you know, all new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL WLA pursuant to 40 CFR §122.44 (d)(1)(vii)(B). Please submit all such permits to EPA for review as per EPA's letter dated October 1, 1998.

If you have any questions or comments concerning this letter, please don't hesitate to contact Mr. Peter Gold at (215) 814-5236.

Sincerely,

Jon M. Capacasa, Director
Water Protection Division

Enclosure

France,Becky

From: Foster,Kip
Sent: Wednesday, October 29, 2008 9:08 AM
To: France,Becky
Subject: FW: Revised WPM Minutes
Attachments: WPM Oct 2008.doc

Becky,

Based on the result of discussions during the WPM meeting this week we are not including metals loading limits in permits that have allocations listed in a TMDL. This results in significant changes to the Nanochemonics permit. I went through the permit and factsheet and tried to identify what needs to come out. I put the draft back in your mail box. Please modify the permit to reflect these changes in policy. Thanks.

Kip Foster
WCRO Water Permit Manager
540-562-6782

From: Newman,Allen
Sent: Wednesday, October 29, 2008 8:47 AM
To: Fowler,Keith; Cunningham,Frederick; Tuxford,Burton; Brockenbrough,Allan; Daub,Elleanore; Thompson,Alison; Thomas,Bryant; Foster,Kip; Linderman,Curtis; McConathy,James
Subject: Revised WPM Minutes

Attached are revised minutes based on Keith's and Kip's comments. Any final corrections?

The Water Permit Managers had their October 2008 conference call on October 27, 2008. Attendees were:

CO: Fred Cunningham, Allan Brockenbrough,
Burt Tuxford, Ellenaore Daub, Valerie Rourke
TRO: Jim McConathy
NRO: Bryant Thomas, Alison Thompson
VRO: Keith Fowler
BRRO: Kip Foster
PRO: Curt Linderman
SWRO: Allen Newman - Host

1. Water Reclamation and Reuse Regulation- Valerie
   Regulation was effective Oct 1; copies on DEQ net; Draft implementation Guidance to ROs soon. Valerie hopes that final guidance with be published by end of yr. Implemented through VPDES and VPA programs. Valerie offered to answer any questions on specifics as we go along.
2. Draft TMDL Approach for Individual VPDES Permits- Fred
   CO has drafted guidance from the permit and TMDL group presented by email from Fred on Oct 22 (attached to these minutes). CO plans conference call from representatives from TMDL, permit group and ROs to work on this task. We agreed to revise Fred's email guidance to eliminate annual loadings for metals.
3. Questions on Permit Fee Review – Fred
   Fred commented on the fee correction email. Curt commented on the fact that CEDS screens have changed in the last permit term so some apparent errors were not errors when the permit was processed. Fred noted plans are being developed to QA the data every yr prior to fee notices being mailed.
4. New VPDES permits proposing to discharge onto VDOT right of ways – Fred
   Fred noted that issues came up as a result of a facility that has been discharging to a VDOT ditch for some time. Bottom line, VDOT would like us to notify them and the owner on issuance of a permit. VDOT has a procedure for using the ROW. Curt stated that this is not necessary, we develop limits to meet WQS. Keith asked: what distance should we notify them, noting that some dry ditches travel for some distance before entering a VDOT ROW. Bottom line from Fred is that we should notify them on new individual VPDES applications that discharge to VDOT ROW using our BPJ.
5. Coordination of Facility Closure and Final Inspections – Fred
   Steve Stell audit indicated that better coordination is needed on final inspections. The purpose of this item is for Fred to advise ROs to coordinate on closures from the permit and RO compliance groups so that inspections are made confirming closure.
6. When to hold off on issuing the 2004 version of the SWGP and wait on the 2009 version-Bryant

Allison asked if we charge them for the old and new permit. Burt stated yes, until DEQ decides to stop accepting the old registration statement. But first verify with the applicant that they actually need the coverage prior to 7/1/09.

7. OWE transition-Curt

   Much discussion was provided, all of which voiced concerns about the shift of work from OWE to the RO. Jim raised a comment voicing concern about needing assistance from the OWE regarding technical review. Fred noted that a final guidance is being considered by the EMT.

8. CEDS administratively continued checkbox-Curt noted

   that CEDS allows generation of DMRs and entering DMR data after a permit has expired only if the administratively continued check box is checked. Curt wanted an option for the case where the permit has expired, and does not qualify for administrative continuation, but would allow CEDS DMR generation and data entry. Much discussion occurred. Bottom line we must use CEDS to meet our needs realizing that re-programming CEDS may take time.

9. Antidegradation Workgroup- Fred noted that environmental groups commented to the SWCB that DEQ should consider antidegradation on a pollutant by pollutant basis. Bottom line is that DEQ will form a work group to consider.

10. Next WPM call November 19 at 10:00 with TRO host.

CO Advice email entitled: Draft TMDL Approach for Individual VPDES Permits:

From: Cunningham,Frederick
Sent: Wednesday, October 22, 2008 3:30 PM
To: Tuxford,Burton; Brockenbrough,Allan; Daub,Elleanore; Thompson,Alison; Thomas,Bryant; Foster,Kip; Fowler,Keith; Linderman,Curtis; McConathy,James; Newman,Allen
Cc: Martin,Charles; Lott,Craig
Subject: Draft TMDL Approach for Individual VPDES Permits

Good afternoon,

Over the next few months the CO TMDL and Permit sections plan to develop guidance to address the inclusions of TMDLs into individual VPDES permits. Until this TMDL guidance is finalized we are proposing the following approach for issuance of individual permits. Please review prior to our Permit Managers meeting on the 27th so we can discuss. Thanks.

Fred

TSS TMDL - tons/yr or lb/yr

TSS TMDL Permit Limits - municipal facilities

Include kg/d limits expressed as a monthly and weekly limit based on the TMDL. Concentration limits for the permit are the secondary federal effluent guideline (30 mg/l, 45mg/l) unless BPJ or other regulations (e.g. Potomac Embayment) require more stringent concentration limits.

TSS TMDL Permit Limits - industrial facilities

Handle on cases by case basis since there have been few of these thus far.

Metals TMDL - kg/yr

Metal TMDL Permit Limits - municipal and industrial facilities

Include kg/year limit based upon the TMDL. Concentration limits should be based upon existing permit water quality criteria concentrations. Add a special condition to explain how to calculate calendar year limit.

Bacteria TMDL - cfu/yr

Newer TMDLs have a 'growth factor' included for increased flows usually 2 - 5X the flow so any permits that get reissued use 126 cfu/100ml - no reductions in concentration are necessary for flow tiers because the TMDL considered growth. No limit per calendar year.

Older TMDLs are based upon existing flow so growth or flow tiers are not considered. The loads are cfu/year and usually based on 200 or 126 E.coli. Region may lower the bacteria concentrations limits to meet the original TMDL load as the facility flows increase or may revise the

TMDL (in house) to include a 'growth factor' and issue permit with 126 cfu/ml limit. In either case no limit per calendar year.

Fred K. Cunningham, Director

Office of Water Permits & Compliance Assistance

Virginia Department of Environmental Quality

phone: 804.698.4285

fax: 804.698.4032

Attachment F

Benthic Stream Data

- 1994 Fact Sheet Antidegradation Analysis (Excerpt)
- Study Protocol for Annual Benthic Macroinvertebrate Survey of Peak Creek 8/10/00 Revision (Excerpt)
- 1999-2007 Annual Benthic Biomonitoring Report Summaries
- Benthic Biomonitoring Data Tables (2005, 2006, 2007)

15. Effluent Limitations:

DEQ guidance memo 93-015 was used in developing all water quality based limits pursuant to water quality standards (VR-680-21-00). Stormwater guidance memo 93-010A was applied to stormwater outfalls. TMP guidance memo 93-029 was applied to the toxics monitoring program analysis.

Antidegration analysis: Antidegradation was examined because Magnox has expanded its production and the permit application indicated an increase in the max 30 day average flow from 0.7 MGD to 1.213 MGD when compared to application for the 1989 permit reissuance. In order to assess if antidegradation applies to this situation, the new permit application must represent an increase in instream concentration of pollutants. The mass loadings for several (total recoverable) parameters were compared in the following table.

Parameter	1989 application	1994 application
Cadmium, kg/d	0.037	<0.0005
Tot. chromium, kg/d	0.05	0.123
Copper, kg/d	0.13	0.064
Lead, kg/d	ND	0.011
Nickel, kg/d	0.38	0.086
Silver, kg/d	0.05	0.001
Zinc, kg/d	0.14	0.338

Reductions in loadings were noted in cadmium, copper, nickel, and silver. Increases were noted in total chromium and zinc. Based on this data, antidegradation does apply.

The next step in this process is to determine the Tier of Peak Creek at the discharge point. There is no available dissolved metals data below Magnox to determine if the stream segment is in compliance with WQS or exceeding WQS. In the abscence of suitable chemical data, 93-015 (attachment 6) allows the use of biological data that demonstrates in stream toxicity. There are numerous studies available that indicate toxicity in Peak Creek below Magnox. The three that were used to assess Peak Creek for this permit were "Peak Creek Sediment Metals" by L.D. Willis, Regional Biologist for WCRO-DEQ (November, 1989); "Instream Impact Study", First Quarter, by Olver, Inc. dated February 10, 1992; "Instream Impact Study", Second Quarter, by Olver, Inc., dated May 8, 1992. (See **Attachment I** for copies of pertinent sections.) The report by Dr. Willis indicated that biomonitoring downstream at the Rt 99 bridge below Pulaski found no life in the vicinity. The two reports by Olver, Inc. reported an impact on the downstream populations based on toxicity testing and a benthic macroinvertebrate study.

Antidegradation Analysis (2 of 5) 109
1994 Fact Sheet

VIRGINIA WATER CONTROL BOARD
WEST CENTRAL REGIONAL OFFICE

PEAK CREEK SEDIMENT METALS

November 1989

Prepared by

Lawrence D. Willis
Regional Biologist

WCRO

Recent biomonitoring results have indicated a toxicity problem in Peak Creek, Virginia. Biomonitoring has found no aquatic life in the vicinity of the Route 99 bridge. These data initiated a benthic survey and this survey of sediment metals.

Several possible sources of heavy metals exist, but two primary locations are Magnox, Inc., and the Allied waste piles. Magnox, Inc., (previously Hercules) has a permitted discharge to Peak Creek and uses heavy metals in the manufacture of magnetic tape. Allied made sulfuric acid and ferric sulphide. The Allied plant closed in 1976 and left behind extensive waste chemical piles.

In addition to these two sources, there are natural deposits of heavy metals in the area. Abandoned iron and coal mines are common in the area upstream of Pulaski. These mines supplied ore for three furnaces in Pulaski. Slag from these furnaces was later used for fill for construction sites and many of the town's shopping centers are built on it. This fill is another potential source of heavy metal contamination.

In April 1976 the Virginia Water Control Board (VWCB) received two pollution complaints that represent the first documented indication of a heavy metal problem in Peak Creek. One complaint was a fish kill (17,700 fish) caused by a spill of 150,000 gallons of ferric oxide from a collapsed lagoon. The other complaint was of the creek turning red. This problem was traced to runoff from the Allied waste chemicals. Table 1 summarizes the events documented in the West Central Regional Office (WCRO) files concerning this matter. The WCRO asked both Allied and Downtown East, Inc., the present owner, to stop the runoff or remove the chemicals. Neither party has stopped the runoff. The only action taken has been a lawsuit by Downtown East, Inc., against a neighboring shopping center to stop runoff onto the waste piles.

The purpose of this study was to map the occurrence and magnitude of sediment metals in Peak Creek, to provide data, and recommendations for managers to utilize in deciding if further study is necessary.

STUDY SITE AND METHODS

Peak Creek changes from a third to a fourth order stream in the town of Pulaski. The stream drains an area that was once heavily mined for coal and iron. Figure 1 shows the sample stations for this study and the stations that are regularly sampled as part of our ambient monitoring system. In addition, Figure 1 shows the locations of some of the potential sources of heavy metals.

The data presented from the ambient monitoring stations is a mean of the data in storet from those stations. The data sampled during this study are based on single samples collected on June 13, 1989.

Table 2 shows percentiles for sediment heavy metals in the state of Virginia. These percentiles can be interpreted as the probability of a stream having a lower concentration. The 1.00 percentile is the maximum value recorded in the state. The 0.95 percentile means there is a 5 percent chance of a stream having a higher concentration.

RESULTS

Table 3 gives the concentration of selected heavy metals in Peak Creek by river mile. Copper, lead and zinc show relatively high levels at the control site. In fact, these values are above the statewide 0.95 percentile. Below Magnox a small increase was observed in nickel, zinc and selenium while copper declines.

The Allied waste chemical piles showed very high concentrations of copper, lead, iron, selenium and cadmium. One hundred meters below where the drainage from these piles enters the stream the concentrations are very similar to those found in the waste piles. The concentrations of copper and selenium at this point are above the 1.00 percentile. Lead, zinc and cadmium are above the 0.99 percentile. The appearance of high levels of selenium and cadmium below the waste piles indicates the waste is entering the stream.

The trend for high metals continues into Claytor lake to the mouth of Peak Creek. One data sheet was found in the files that showed high metals at the Claytor Lake Dam.

CONCLUSIONS AND RECOMMENDATIONS

These data indicate Peak Creek has one of the highest concentrations of heavy metals in the state of Virginia. The high values upstream of Pulaski indicate either drainage from the old mines or else natural inputs. The high community scores observed here during this summers benthic survey means the organisms have either adapted genetically to these concentrations, the metals here are not in a form to be toxic or the metals are at lower than toxic concentrations. The slight increase below Magnox is small and probably not significant. More study is needed to determine if the change is real or in the range of variability for the data. The similarity of the concentrations below the waste chemical piles to the waste chemicals is convincing evidence that the chemicals are entering the stream. This is also the point at which aquatic life becomes most depauperate.

There are obviously many sources of metals in Peak Creek. To adequately determine the relative impact of all the sources will require a large survey by WCRO. This preliminary survey has identified a major source of these metals as the Allied chemical piles. The appropriate steps should be to insure that the runoff from these piles is stopped.

The concentrations in the sediments are high enough to present a real possibility of high concentrations in the fish of Claytor Lake. I recommend fish sampling as soon as possible to determine the potential for human health risk.

Removing the contaminated sediments in Peak Creek is probably not a realistic possibility. However, if the runoff can be stopped from entering the stream, the contaminated sediments could eventual be covered by noncontaminated sediments.

TABLE 1

FILE DATA CONCERNING PEAK CREEK METALS PROBLEM

Permit issued to Allied Chemical for cooling water discharge.	August 30, 1974 August 30, 1979
Robert Conrad reported red color in Claytor Lake. D. M. McLeod investigated and found the source to be Allied Chemicals waste chemical piles. The waste is from production of sulfuric acid. A bulldozer was observed at the chemical pile.	April 2, 1976
Ken Ragland writes Allied Chemical stating the discharge is illegal and remediation must be undertaken. Request for a plan for removal or containment by June 17, 1976. No reply found in the files. Chemical analysis reveals: cadmium - 0.58 lead - 150 chromium - 28.8 zinc - 2010 copper - 886 nickel - 17.3 (ppm in water)	May 14, 1976
Hercules Inc. (now Magnox) lagoon broke spilling ferric oxide into Peak Creek, 17,700 fish were killed.	April 13, 1976
Allied closes.	July 1, 1976
Ken Ragland writes Downtown East, Inc. which bought the Allied site. Request is made for a plan to remove or contain the material by June 15, 1978. Letter from H. W. Huff (Downtown East, Inc.)	May 12, 1978 June 26, 1978
Petition received from Peak Creek land owners to stop pollution of Peak Creek. Four Three (43) signatures.	July 1978
Downtown East writes a letter to the shopping center which drains onto chemical piles.	July 27, 1978

TABLE 1 (cont.)

Benthic Survey to determine effect of Pulaski County landfill.	January 1980
Janet Queisser reports red color in Peak Creek due to Allied Chemical.	March 20, 1980
Letter from Downtown East stating a lawsuit was pending against the shopping center. This is the same lawsuit L. D. Willis has been requested to testify at.	April 9, 1980
Letter from Don Prager to H. W. Huff concerning complaints of runoff from the chemical piles.	August 28, 1984 again Nov. 30, 1984
Letter from H. W. Huff still talking about the law suit.	December 1, 1984
Lawrence Willis found very low numbers of organisms at the Hwy. 99 Bridge indicating toxicity problem.	September 9, 1988
Lawrence Willis found no life at the Hwy. 99 Bridge.	May 3, 1989
A benthic study was performed indicating several possible problems, but most severe impact was attributed to the runoff from Allied waste piles.	June 13, 1989
Sediment data was analyzed for this report.	October 1989

TABLE 2

Cumulative Frequency Distribution
for Toxic Substances in Sediments in Virginia

VARIABLE	100%	99%	95%	85%
Arsenic	66.8	32.04	21.0	14.4
Mercury	29.0	1.8628	0.71991	0.2799
Lead	1570.0	385.36	173.0	77.3
Chromium	12000.0	100.02	68.14	44.96
Cadmium	30.0	6.94	2.4	0.65
Zinc	10700.0	1178.54	384.0	184.0
Copper	1570.0	235.92	90.11	41.29
Nickel	256.0	57.44	37.62	26.09
Selenium	34.1	19.138	12.8	8.0
Beryllium	2.8	2.4	2.1	2.06
Thallium	48.0	28.968	12.67	7.45

NOTE: Prepared by Jean Tingler, OWRM

TABLE 3

SELECTED SEDIMENT METALS IN
PEAK CREEK BY RIVER MILE

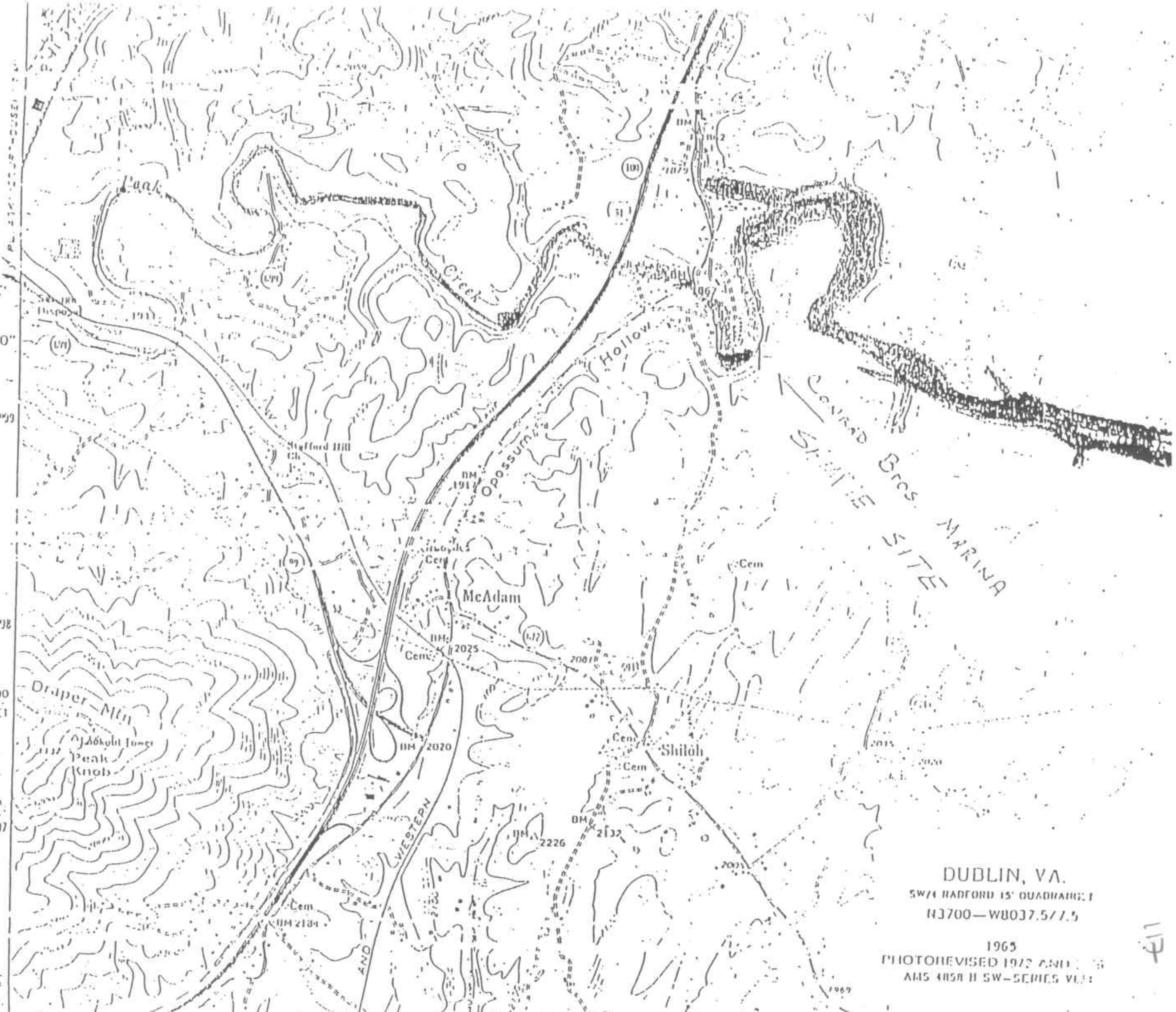
STATION	RM	CU	PB	NI	ZN	FE	SE	CD
Commerce Street	-11.11	177[1]	222[1]	15	1070[1]		1	1
Below Magnox	-10.35	63	346[1]	31	1150[1]	34000	8	1
Radio Station								
Allied Chemical	-9.00	3200[2]	2040[2]	12		460000	274[2]	23[1]
Below Input	-8.72	3120[2]	1200[1]	16	3370[1]	311000	125[2]	9[1]
Route 99 Bridge	-7.82	650[1]	200[1]	10	1830[1]			
Conrad Brothers*	-4.16	398[1]	147	23	1400[1]	47000	16[1]	2
Mouth*	0	85.65	115	27.7	411.5[1]		10	
Claytor Lake Dam* (1981)		50.9	184[1]	41.38[1]	458[1]			6[1]

*Claytor Lake Stations
[1]Above 95 Percentile
[2]Above 100 Percentile

NOTE: Metal concentrations are dry weight mg/kg (ppm).

26-009kr.wp

116


Conrad Bros Marina
SAME SITE
Opossum
Hollow
Creek
Peak
Stafford Hill Ch
BM 1917
Cem
McAdam
BM 2025
Cem
BM 2020
Draper Mtn
Peak Knob
Shiloh
Cem
BM 2226
BM 2132
Cem
BM 2184
WESTERN
AND
260 000 FEET
DUBLIN, VA.
1965

reviewed 9/6/00 BA

STUDY PROTOCOL FOR ANNUAL BENTHIC MACROINVERTEBRATE SURVEYS OF PEAK CREEK IN THE VICINITY OF MAGNOX-PULASKI INCORPORATED

Prepared for:

Mr. Carmine DiNitto
Magnox-Pulaski Incorporated
P.O. Drawer 431
Pulaski, Virginia 24301

Prepared by:

Olver Laboratories Incorporated
1116 South Main Street
Blacksburg, Virginia 24060

August 10, 2000
Job Number 61341.200

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1.0 INTRODUCTION

1.1 Background

The Magnox-Pulaski Incorporated, Pulaski, Virginia facility manufactures synthetic iron oxide for use in the magnetic recording industry. As a result of the manufacturing processes associated with this product, treated wastewater is discharged into Peak Creek in accordance with the provisions of VPDES Permit No. VA0000281. Prior to discharge at Outfall 001, the wastewater is treated with lime slurry, followed by flocculation, precipitation, settling, and neutralization with carbon dioxide. In addition, storm water from paved and other impervious areas is discharged to Peak Creek from Outfalls 002, 003, and 004, located downstream of Outfall 001.

In March of this year, Magnox initiated lime slurry treatment to the wastewater based upon flow volume. Prior to this, the addition of lime was dependent on the pH of the wastewater. As such, lime was not always added in the treatment process. Recent toxicity testing investigations concluded that cobalt levels in the final effluent were reduced to non-toxic levels when lime was included in the treatment process irregardless of the initial pH of the wastewater. This modification in the use of the lime represents the only change in the treatment process since the last benthic macroinvertebrate study was performed in 1998.

The receiving stream, Peak Creek (New River Basin; New River Subbasin, Section 2), is a small third order stream originating in eastern Pulaski County. The stream flow is regulated in part by discharges from the Gatewood and Hogan Reservoirs, located several miles upstream of the Magnox-Pulaski facility. The upper Peak Creek watershed is depicted in Figure 1.

In 1992, an instream impact study was initiated to evaluate the influence of effluent discharged from Magnox on the indigenous aquatic community of Peak Creek. As part of this study, a quantitative macroinvertebrate survey was performed and indicated moderate impairment in areas directly downstream of the Outfall 001 discharge point. Since that time, Magnox has implemented wastewater treatment improvements and has initiated discharge of some process wastewater to the regional wastewater treatment system. The most recent macroinvertebrate study conducted in 1998 indicated slight impairment downstream of the discharge point.

The current VPDES permit issued to Magnox on June 28, 1999 includes a requirement to perform annual benthic surveys of Peak Creek in the vicinity of the discharge point. Specifically, the permit requirement states:

> Annual qualitative benthic macroinvertebrate studies shall be performed on Peak Creek to assess impacts of all permitted discharges and shall be conducted between mid-August and October. The first benthic study shall be conducted one year following the effective date of the permit during the designated months. Study design shall be approved by DEQ staff prior to initiation of testing.

This plan describes the methods proposed to evaluate the influence of process wastewater and storm water discharges on the indigenous macroinvertebrate community of Peak Creek and if possible, evaluate any changes in effluent influence observed in 1998.

1.2 Objectives

The purpose and goal of this study is the determination and evaluation of any impacts on the indigenous aquatic organisms of Peak Creek resulting from the discharge of effluent from the Magnox-Pulaski facility. Specific details regarding the methods to be used and the evaluation of the data are described in the following sections.

2.0 MATERIALS AND METHODS

2.1 General Characteristics of Peak Creek

The general physical and biological characteristics of the head waters of Peak Creek are typical of low order streams originating in southwest Virginia. As such, this stream is predominantly allochthonous, receiving much of its organic materials and metabolic energy from external sources such as leaf litter and similar materials. The substrate is generally small boulders, rubble, and cobble with exposed bedrock in areas with higher stream gradients. Much of the creek is shaded by deciduous forest cover, although riparian trees have been removed from substantial lengths of the stream in areas directly upstream of the Magnox facility. The creek in the vicinity of the Magnox facility is typically 3 to 6 meters wide and with the exception of one small impoundment located directly upstream of the discharge point, flow is generally fast.

2.2 Methods

To evaluate the potential occurrence and degree of effluent impact, annual qualitative (or quantitative) benthic macroinvertebrate surveys of Peak Creek in the vicinity of Magnox-Pulaski discharge point will be conducted. To facilitate direct comparisons with previous studies, these studies will be conducted using the procedures (with appropriate modifications) described in "Rapid Bioassessment Protocols for Use in Streams and Rivers - Benthic Macroinvertebrates and Fish", EPA/444/4-89/001. Accordingly, Protocol II methods will be used in the performance of these studies.

2.2.1 Monitoring Period

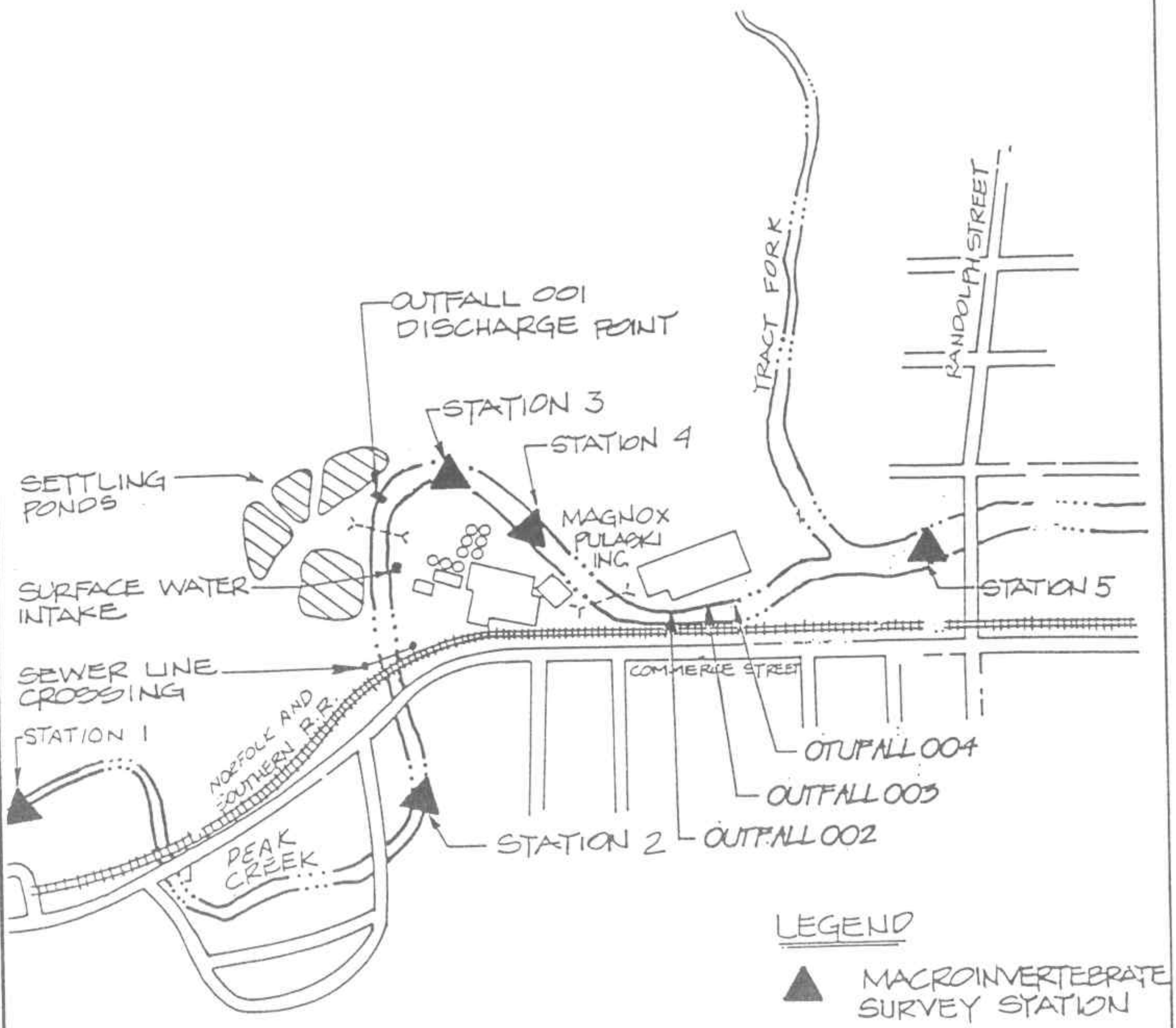
Sample collection will be performed in the mid-August to October first time period, before the second major seasonal emergence cycle is initiated. Additionally, stream flows during this time are typically the lowest of the year, and the data generated from these collections should be indicative of any effluent impacts.

2.2.2 Monitoring Station Locations

Site inspections of the Peak Creek study area were conducted in August 1990 and again in March 1991 with Virginia Water Control Board (VWCB) staff for the purpose of locating suitable benthic macroinvertebrate sampling stations. Accordingly, suitable riffle areas were examined since these environments generally provide the highest densities of diverse macroinvertebrate populations. Six sampling stations located at varying distances upstream and downstream of the Magnox-Pulaski discharge point representing control, impact, and recovery zones were selected and used for the instream impact study and initial benthic surveys. To facilitate comparisons with previous work, five of the same six stations will be used for the annual surveys. The sampling site identified as Station 5 in the past studies will not be included in these benthic macroinvertebrate studies. The substrate at this station, which was located just upstream of the confluence with Tract Fork, is bedrock and stream flow is through braided channels of varying depths. As such, sample collection is very difficult and the differences in the benthic community (relative to the control sites) may be more influenced by habitat differences than by any effluent influence. The locations of the five benthic macroinvertebrate survey sample collection stations with respect to the Magnox-Pulaski facility are depicted on Figure 2.

Stations 1 and 2 were selected to encompass control areas and are located upstream of the Magnox-Pulaski facility. A second site inspection was conducted in March 1991 with the assistance of the VWCB regional biologist for the purpose of evaluating and selecting an upstream reference site representative of best attainable conditions for the Peak Creek study area. Accordingly, a site located near or upstream of the first Commerce Street bridge, depicted on Figure 2, was selected. Samples have been collected in this area for evaluations conducted by the VWCB/DEQ and the macroinvertebrate community in this area showed no indications of pollution impacts. Station 2 will be located in a shallow riffle area approximately 100 meters upstream of the discharge point. Both Stations 1 and 2 will be used for comparisons with the remaining sampling areas for the evaluation of any effluent impacts.

Station 3 will be located in a riffle area approximately 20-30 meters downstream of the discharge point at or near the zone of initial complete effluent mix. Stations 4 and 5 will be located increasingly farther downstream of the discharge point and will serve as indicators of recovery from any observed effluent impacts. These stations will also serve as indicators of any influence from the discharge of storm water runoff. Station 4 will be located approximately 60 meters downstream of the discharge point. Station 5 will be located in a riffle area approximately 20 meters downstream of the confluence with Tract Fork, a significant tributary to Peak Creek. The final location of each sampling station will



BENTHIC MACROINVERTEBRATE SURVEY
SAMPLE COLLECTION STATIONS
FIGURE 2

NO SCALE
JOB NO.: 61341

AUG. 5, 1997
MAGNOX\SAMPCOLL

be determined based on habitat conditions, with an effort made to ensure that all sampling sites are as similar as possible.

Station 5, will be relocated to the site below the confluence with Tract Fork that was previously identified as Station 6. Sampling sites below this point are not appropriate as the creek is channelized as it passes through the center of the Town of Pulaski and is likely influenced by storm water runoff from the downtown area.

2.2.3 Monitoring Station Characterization

In addition to habitat characterization, selected physical, chemical, and biological analyses will be conducted at each station. Physical analyses will include the determinations of water temperature, stream width, and stream depth. Chemical analyses will include the determinations of pH using an Orion Model 230 Portable pH Meter, conductivity using a YSI Model 33 Salinity-Conductivity-Temperature Meter, and dissolved oxygen using a YSI Model 54-A Dissolved Oxygen Meter.

2.2.4 Sample Collection

The slight modifications to the sample collection procedures described for Protocol II and used in the previous benthic studies will again be made in these studies to incorporate site-specific conditions and to improve the accuracy of effluent impact determinations. Qualitative or quantitative benthic macroinvertebrate samples will be collected from these sites within each station encompassing left bank, mid-stream, and right bank areas, wherever possible. To the greatest extent possible, all samples will be collected from habitats with similar physical characteristics. Macroinvertebrate collections will be made using Portable Invertebrate Box Samplers (PIBS), since these samplers often include substantial numbers of macroinvertebrates typically lost when using kick nets or other similar samplers. As such, use of these samplers may improve the accuracy of effluent impact evaluations. Upon completion of collection, macroinvertebrates from each site will be separated from large debris material, placed in wide mouth containers, and preserved in the field with 95% ethanol.

Where stream conditions permit, coarse particulate organic matter (CPOM) samples will be collected at each station to provide an indication of the relative abundance of shredders. Sampling will be performed using a D-frame kick net and will incorporate 3 to 5 individual leaf packs. Initial processing will occur in the field, and the samples will be composited, preserved, and returned to the lab for further processing and evaluation.

2.2.5 Sample Processing and Analysis

Upon return to the laboratory, the macroinvertebrates will be identified to lowest practical taxa (usually family or genus) using standard taxonomic keys. Conventional distribution parameters will be examined to evaluate the effects, if any, of effluent on the benthic macroinvertebrate community. These parameters include the number of taxa, density, diversity, equitability, and the distribution of pollution-tolerant, facultative, and pollution-sensitive organisms.

In addition to the aforementioned conventional macroinvertebrate distribution parameters, RBP II metrics will also be included to support a more thorough assessment of the biological condition of each station relative to the reference stations. These metrics include:

1. Taxa Richness;
2. Family Biotic Index (modified);
3. Ratio of Scrapers/Filtering Collectors;
4. Ratio of EPT and Chironomid Abundances;
5. Percent Contribution of Dominant Family;
6. EPT Index;
7. Community Similarity Index; and
8. Ratio of Shredders/Total Number of Organisms Collected.

3.0 REPORTING

Upon completion of collection and organism processing, a final report will be prepared for submittal to the DEQ. This report will summarize the methods used, the results of the station evaluations and a general assessment of any effluent influence on the benthic macroinvertebrate community. In addition, all field data and macronivertebrate identification and quantification data will be included.

4.0 SCHEDULE

The annual sample collection activities will be performed in the mid-August to October time period when stream flows are typically low. Macroinvertbrate processing and report preparation will be performed over the following 90 days and the final report submitted on or about the following February 10 of each year.

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MEMORANDUM

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
West Central Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Comments on the Benthic Macroinvertebrate Survey of Peak Creek (dated January 8, 2008) conducted by Olver Incorporated for Nanochemonics (formerly Magnox Specialty Pigments Inc.), (VPDES Permit No. VA0000281)

TO: Becky L. France, Environmental, Engineer, Sr.

FROM: Drew Miller, Regional Biologist

DATE: January 23, 2008

COPIES: Greg Anderson, Kip Foster, Mary Dail, George J. Devlin, file

I concur with the Olver Inc. study results showing that there is a significant effluent effect in Peak Creek at the stations downstream of the Nanochemonics (Magnox) discharge. This is most notably seen in the reduction of total taxa, especially those in the EPT (Mayfly, Stonefly, and Caddisfly) orders. This includes the reduction of Mayfly (pollution sensitive order) individuals at Stations 3 – 5 (from 141 to 15 individuals at station 2 to station 3, respectively). There is also a reduction in scrapers at Stations 3, 4 and 5. These organisms feed by scraping food from relatively clean substrate surfaces. In addition, at Stations 3, 4 and 5 there is an increase in organisms that feed through collecting/filtering. These organisms feed by filtering the water column and are typically dominant in streams impacted by excessive nutrients and organic waste. Similar to historical surveys, the dominant collector/filterer organism at Stations 3 – 5 is the facultative caddisfly family *Hydropsychidae*.

In past surveys, chemical monitoring results showed a large increase in conductivity between the reference station and Station 3 (from 62 to 1903 umhos/cm in fall 2003). The 2005 survey found conductivity at Station 3 to be 118 umhos/cm. Despite the lower conductivity, the benthic community did not improve from historical surveys. The 2006 survey found conductivity to be 375 umhos/cm. The current survey found conductivity to be 567 umhos/cm on September 26, 2007. These data indicate that the discharges may have decreased between 2003 and 2005, but increased since the 2005 survey.

A TMDL study conducted for the benthic impairment of Peak Creek in 2004 did not consider Nanochemonics to be a source of stress based on information indicating process wastewater from the plant was being sent to the Peppers Ferry WWTP. However, current, as well as, historical surveys indicate that discharges from Nanochemonics have had a continual impact on Peak Creek. Based on this information, I suggest continued annual monitoring to determine if the benthic community displays improvement. Additionally, I suggest the inclusion of the Nanochemonic plant impacts into the TMDL Implementation Plan for the restoration of Peak Creek.

MEMORANDUM

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
West Central Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Comments on the Benthic Macroinvertebrate Survey of Peak Creek (dated January 5, 2007) conducted by Olver Incorporated for Nanochemonics (formerly Magnox Specialty Pigments Inc.), (VPDES Permit No. VA0000281)

TO: Becky L. France, Environmental, Engineer, Sr.

FROM: George J. Devlin, Regional Biologist

DATE: March 26, 2007

COPIES: Greg Anderson, Kip Foster, Mary Dail, Drew Miller, file

I concur with the Olver Inc. study results showing that there is a significant effluent effect in Peak Creek at the stations downstream of the Nanochemonics (Magnox) discharge. This is most notably seen in the reduction of total taxa, especially those in the EPT (Mayfly, Stonefly, and Caddisfly) orders. This includes the nearly complete absence of Mayfly (pollution sensitive order) individuals at Stations 3 – 5. There is also a reduction in the percentage of scrapers, organisms which feed by scraping food from relatively clean substrate surfaces, at Stations 4 and 5. Similar to historical surveys, the benthic communities at Stations 3 – 5 had considerably higher percentages of the facultative caddisfly family *Hydropsychidae* relative to the reference stations. This family is typically dominant in streams impacted by excessive nutrients and organic waste.

In past surveys, chemical monitoring results showed a large increase in conductivity between the reference station and Station 3 (from 62 to 1903 umhos/cm in fall 2003). The 2005 survey found conductivity at Station 3 to be 118 umhos/cm on October 31, 2005. Despite the lower conductivity, the benthic community did not improve from historical surveys. The current survey found conductivity to be 375 umhos/cm on August 22, 2006. These data indicate that the discharges may have decreased between 2003 and 2005, but had increased during the 2006 survey period.

A TMDL study conducted for the benthic impairment of Peak Creek in 2004 did not consider Nanochemonics to be a source of stress based on information indicating process wastewater from the plant was being sent to the Peppers Ferry WWTP. However, current, as well as, historical surveys indicate that discharges from Nanochemonics have had a continual impact on Peak Creek. Based on this information, I suggest continued annual monitoring to determine if the benthic community displays improvement. Additionally, I suggest the inclusion of the Nanochemonic plant impacts into the TMDL Implementation Plan for the restoration of Peak Creek.

MEMORANDUM

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
West Central Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Comments on the Olver, Inc. Benthic Macroinvertebrate Survey of Peak Creek (dated February 8, 2006) conducted for Magnox-Pulaski, Inc. (VPDES Permit No. VA0000281)

TO: Becky L. France, Environmental, Engineer, Sr.

FROM: George J. Devlin, Regional Biologist

DATE: March 9, 2006

COPIES: Greg Anderson, Kip Foster, file

I concur with the study results showing that there is an effluent effect at the stations downstream of the Magnox-Pulaski, Inc. discharge. This is most notably seen in the reduction of EPT (Mayfly, Stonefly, and Caddisfly) families including the complete absence of Mayfly (pollution sensitive order) individuals at Stations 3 – 5. There is also a reduction in the percentage of scrapers, organisms which feed by scraping substrate surfaces at Stations 3 and 4. Similar to historical surveys, the benthic communities at Stations 3 – 5 had considerably higher percentages of the facultative caddisfly family *Hydropsychidae* relative to the reference stations. This family is typically dominant in streams impacted by excessive nutrients and organic waste.

In the past, chemical monitoring data showed a large increase in conductivity between the reference station and Station 3 (from 62 to 1903 umhos/cm in fall 2003). The current survey shows that conductivity at Station 3 was 118 umhos/cm on October 31. Despite the lower conductivity, the benthic community has not improved from historical surveys.

Based on the benthic survey performed by Olver, Inc. that shows a moderate impact to Peak Creek, I suggest continued annual monitoring to determine if the benthic community displays any improvement.

MEMORANDUM
DEPARTMENT OF ENVIRONMENTAL QUALITY
WEST CENTRAL REGIONAL OFFICE

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Comments on the ProChem Analytical, Inc. biomonitoring survey of Peak Creek (dated March 1, 2004) conducted for Magnox-Pulaski Inc. (VPDES Permit No. VA0000281)

TO: Becky L. France

FROM: George J. Devlin

DATE: April 27, 2004

COPIES: Kip Foster, Greg Anderson, Jason Hill, Dr. Larry Willis, file

In this report, ProChem states that Magnox-Pulaski's effluent has "slight" and "potential" affects on the macroinvertebrate communities in Peak Creek (pages 13 and 17, respectively). However, when calculating the RBPII Biological Condition Scores using Station 1 as the reference, Station 2 was rated *Slightly Impaired* and all stations located below the Magnox-Pulaski discharge received a *Moderately Impaired* designation (Table 1).

As with past surveys, specific differences between the reference sites and the impact sites include reduced numbers of the EPT (Mayfly, Stonefly, and Caddisfly) families and a severe reduction in Mayfly (pollution sensitive order) individuals at Stations 3 – 5. Also, the benthic communities at Stations 3 – 5 had considerably higher percentages of the facultative caddisfly family *Hydropsychidae* relative to the reference stations. This family is typically dominant in streams impacted by excessive nutrients and organic waste.

In summary, I believe that there is a moderate impact from the Magnox-Pulaski effluent. Other supporting data include ProChem's chemical monitoring data which shows a pH shift of approximately two units and an extreme fluctuation in conductivity (from 62 to 1903 umhos/cm) between the reference station and Station 3.

Other general comments are as follows: Review of Appendix 3 shows that ProChem is using outdated Virginia Water Control Board family tolerance classifications. Current multimetric indices use metrics based on more recent research. Some examples of misclassifications in Appendix 3 are: *Cambaridae* and *Polycentropodidae* = Facultative (not Sensitive) and *Athericidae* = Sensitive (not Tolerant). Also, review of the Reference section shows that ProChem is using some outdated material. The latest EPA Rapid Bioassessment Protocols were published in 1999 and a more recent edition (1996) of Merritt and Cummins is available. In order to improve the quality of their assessments, I recommend they update reference materials. Based on the benthic and chemical data collected by ProChem, I suggest continued annual monitoring of Peak Creek.

Attachment

Table 1. RBPII scores for Peak Creek stations sampled by ProChem during fall 2003.

RBP II	Station 1			Station 2			Station 3			Station 4			Station 5		
Metric	Value	Ratio	Score	Metric	Ratio	Score	Metric	Ratio	Score	Metric	Ratio	Score	Metric	Ratio	Score
Taxa Richness	19	100	6	15	79	4	13	68	4	14	74	4	14	74	4
MFBI	4.13	100	6	4.41	94	6	5.53	75	4	5.72	72	4	5.52	75	4
SC/CF	0.43	100	6	6.44	1489	6	0.06	13	0	0.06	14	0	0.12	29	2
EPT/Chi Abund	11.75	100	6	7.00	60	4	7.00	60	4	11.57	98	6	7.62	65	4
% Dominant	16.21	16	6	53.76	54	0	70.27	70	0	79.24	79	0	68.94	69	0
EPT Index	9	100	6	6	67	0	4	44	0	5	56	0	6	67	0
Comm. Loss Index	0.00	0	6	0.40	0	6	0.62	1	4	0.57	1	4	0.50	1	4
SH/Tot	0.04	100	6	0.01	24	2	0.03	60	6	0.02	54	6	0.02	34	2
Biological Condition Score			48			28			22			24			20
% of Reference			100.00			58.33			45.83			50.00			41.67
			Reference			Slight			Moderate			Moderate			Moderate

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY

WEST CENTRAL REGIONAL OFFICE

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Comments on the Olver Laboratories Inc. biomonitoring survey of Peak Creek (dated March 26, 2002) conducted for Magnox-Pulaski Inc. (VPDES Permit No. VA0000281)

TO: Becky L. France

FROM: George J. Devlin

DATE: June 20, 2002

COPIES: Kip Foster, Dr. Michael Scanlan, Dr. Larry D. Willis, file

Upon review of this report, I agree that drought conditions have had an impact on the benthic macroinvertebrate community in Peak Creek as it has for most streams in the region, including the reference stations. However, all stations below the Magnox-Pulaski discharge (Stations 3 – 5), showed a distinct reduction in the percent of sensitive organisms collected when compared to both reference stations.

Olver Laboratories Inc. noted that a Town of Pulaski sewer line between Stations 1 and 2 was repaired one-week prior to their sampling (page 39). They also suggest that the prior condition and/or the repair work may have impacted the benthic community. This suggestion has little validity when comparing the benthic community at Station 2 to Stations 3 – 5. In last September's sample, Station 2 had the largest percentage (93.5) of pollution sensitive macroinvertebrates while Stations 3 – 5 ranged from 24.5 to 51.5%. Station 2 also had the highest percentage (50.9) of mayfly individuals (sensitive taxa), while Station 1 had 25.2% and Stations 3 – 5 ranged from 1.0 to 1.4%. The benthic community at Stations 3 – 5 had considerably higher percentages of the semi-tolerant caddisfly family *Hydropsychidae* relative to the reference stations. This family is typically dominant in streams impacted by excessive nutrients and organic waste.

When calculating the Biological Condition Scores using EPA's updated RBP II tolerance values for macroinvertebrate families, using Station 1 as the reference, Station 3 is *Slightly Impaired* and Stations 2, 4, and 5 are *Moderately Impaired*. I suggest that annual monitoring continue at this facility.

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY

WEST CENTRAL REGIONAL OFFICE

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Comments on the Olver Laboratories Inc. biomonitoring survey (dated Feb. 8, 2001) conducted for Magnox-Pulaski Inc. (VPDES Permit No. VA0000281)

TO: Becky L. France

FROM: George J. Devlin

DATE: March 30, 2001

COPIES: Gregory Anderson, Kip Foster, file

As the report by Olver Laboratories states, stations below Magnox-Pulaski discharge point have reduced numbers of pollution-sensitive organisms, especially Stations 4 and 5. The loss of mayfly taxa and the large increases (4 to 8 times), in the caddisfly family *Hydropsychidae* at Stations 3-5 are a clear indication that the discharge is having a significant impact on the stream biota. Other indicators, such as the reduction in a sensitive gastropod family (*Pleuroceridae*) and the occurrence of tolerant gastropod families (*Planorbidae, Physidae*, and *Sphaeridae*), also lead to the determination that Stations 4 and 5 below Magnox-Pulaski are Moderately Impaired.

I agree that the survey results at Station 3 from September 2000 show an improvement from the 1998 survey. However, unless Magnox-Pulaski has made improvements in their treatment process, or, reduced the amount discharged, I am inclined to believe that the improved benthic community is a result of increased rainfall during spring and summer 2000. This is confirmed when looking at the trend in WCRO's biomonitoring data over the last few years, several long-term monitoring stations showed an improvement in the fall of 2000 when compared to the drought period during 1998 and 1999.

Due to the Moderately Impaired status of two of the three stations below Magnox-Pulaski and no convincing knowledge of whether, or not, the slight improvement at Station 3 will be long-term, I recommend that annual monitoring of Peak Creek be continued.

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY

WEST CENTRAL REGIONAL OFFICE

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Comments on the Olver Laboratories Inc. biomonitoring survey (dated Feb. 2, 1999) conducted for Magnox-Pulaski Inc. (VPDES Permit No. VA0000281)

TO: Becky L. France

FROM: George Devlin

DATE: February 24, 1999

COPIES: Larry Willis, Gregory Anderson, Kip Foster, file

According to the protocols used by biologists at the DEQ, the results of the benthic macroinvertebrate survey conducted in Peak Creek in September 1998 show that the stream is moderately impaired due to the impact of discharges from Magnox-Pulaski Inc. One of the primary indicators used by the DEQ to distinguish if a stream reach has been moderately impaired is the disappearance of pollution intolerant taxa in the impacted zone relative to control station(s). Taxa richness of benthic macroinvertebrates (at the family level) declined by 24% between the control stations and the impacted stations. More importantly, the number of pollution intolerant families from the Orders Ephemeroptera, Plecoptera, and Trichoptera (EPT) declined by 50% in the same area. Three sensitive mayfly families (*Heptageniidae*, *Oligoneuridae*, and *Siphlonuridae*) showed substantial declines at Station 3 and were eliminated from Stations 4 - 6. Additionally, sensitive caddisflies (*Philopotamidae*) had been eliminated at station 3 and sensitive snails (*Pleuroceridae*) were eliminated from Stations 4 and 5.

Another reliable indicator of biological impairment is the determination of the percent contribution of the dominant invertebrate family. If one family comprises over 50% of the total number of organisms at one station, the station is usually determined to be moderately impaired. Olver Laboratories Inc. analyzed the data at the genus level, thus reducing the affect of this metric. We recalculated this metric at the family level. At Stations 3 - 5, the caddisfly *Hydropsychidae* (somewhat pollution tolerant) accounted for 83% of all the individual macroinvertebrates sampled, whereas, the dominant family at Stations 1 and 2 were the pollution intolerant mayfly family *Oligoneuridae* (28.6% and 27.4 % respectively). The total number of individual *Hydropsychidae* increased nearly 12x between the control stations and Station 3. Sharp increases of Hydropsychid caddisfly larvae typically indicate that a stream is receiving excessive organic matter, or, that a change in water chemistry has occurred resulting in nutrient enrichment and excessive primary production, or, that metals contamination has occurred. Habitat assessments conducted by Olver Laboratories Inc. (Appendix 1) confirm the increased algal and bacterial growth occurring downstream of Magnox-Pulaski's discharge (Stations 3 - 5).

M E M O R A N D U M

DEPARTMENT OF ENVIRONMENTAL QUALITY

WATER REGIONAL OFFICE

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Review of Magnox Instream Impact Assessment Plan

To: Greg Anderson

FROM: Lawrence D. Willis, Ph.D. LDW

DATE: June 9, 1998

COPIES: Jim Smith, Becky France, File.

I have reviewed the Magnox instream impact study plan and have only a few comments. First, I suggest using more up to date metrics for data analysis. The original RBP metrics are out dated and the state of the art is to use site specific metrics. Specifically, I would not use the ratios of functional feeding types. There are many other metrics that can be used (See Revisions to RBPs 1997). Secondly, I am concerned about the limited time of the study and the heavy rains we are having this year. If the rains continue through the summer we biological conditions could be better than normal instead of worse case. Any conclusion of this study need to be taken in the context of this years' flow conditions. Neither of these comments should result in failing the study proposal. In fact, I suggest approving the study plan and communicating these concerns to the company for their consideration.

TABLE 2
Macroinvertebrate
Assemblage in Peak Creek
on October 31, 2005

TAXA	Functional Feeding Group (Tolerance Values)	STATION 1				STATION 2				STATION 3				STATION 4				STATION 5			
		Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total
ANNELIDA																					
Oligochaeta																					
Brachiodellidae	Collector/Gatherer (8)			1	1																
Insecta																					
Megaloptera																					
Corydalidae																					
Corydalus sp.	Predator (5)										1		1	1			1				
Nigronia sp.	Predator (4)	1	1	2	4	1	2	1	4	1	1	1	3	1		1	2	1		1	2
Sialidae																					
Sialis latreille	Predator (7)	1			1																
Trichoptera																					
Hydropsychidae																					
Hydropsyche sp.	Collector/Filterer (6)						2	8	10	10	21	24	55	24	23	14	61	19	9	10	38
Cheumatopsyche sp.	Collector/Filterer (6)									2	7	6	15	7	6	3	16	6		4	10
Diplectrona sp.	Collector/Filterer																				
Philopotamidae																					
Chimarra sp.	Collector/Filterer (3)	2	1		3																
Hydroptilidae																					
Hydroptilla sp.	Scraper																				
Helicopsychidae																					
Helicopsyche sp.	Scraper																				
Limnephilidae																					
Apatania sp.																					
Platycentropus sp.																					
Neophylax sp.	Scraper																				
Goera sp.	Scraper																				
Goerita sp.																					
Ephemeroptera																					
Isonychiidae																					
Isonychia sp.	Collector/Filterer (3)					3	1	29	33												
Heptageniidae																					
Stenacron sp.	Collector/Gatherer (4)	1		1	2		1	5	6												
Stenonema sp.	Scraper (4)	21	8	6	35	10	16	46	72												
Baetidae																					
Baetis sp.	Scraper																				
Caenidae																					
Caenis sp.	Collector/Gatherer																				
Siphlonuridae																					
Siphlonurus sp.	Collector/Gatherer																				
Ameletus sp.	Collector/Gatherer																				
Ephemerellidae																					
Eurylophella sp.	Collector/Gatherer (4)			1	1		3		3												
Plecoptera																					
Perlidae																					
Acroneuria sp.	Predator (2)										1		1	2	1		3				
Perlesta sp.	Predator																				
Paragenita sp.																					
Chloroperlidae																					
Haploperla sp.																					
Taeniopterygidae																					
Taeniopteryx sp.	Shredder																				
Capniidae																					
Allocapnia sp.	Shredder (1)	1	4		5																

TABLE 2
Macroinvertebrate
Assemblage in Peak Creek
on October 31, 2005

TAXA	Functional Feeding Group (Tolerance Values)	STATION 1				STATION 2				STATION 3				STATION 4				STATION 5			
		Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total
Coleoptera																					
Psephenidae																					
Psephenus sp.	Scraper (4)	4		2	6	4	8	4	16	4	4	2	10	2	5		7	20	2	6	28
Elmidae	Scraper (4)	17	4	1	22	9	9	10	28	7	5	6	18	1	5	11	17	49	12	21	82
Stenelmis sp.	Scraper (5)																				
Optioservus sp.	Scraper (5)																				
Hydrophilidae																					
Diptera																					
Chironomidae	Collector/Gatherer (6)	3			3	2	1	1	4	1	10	6	17	8	3	3	14		1		1
Athericidae																					
Atherix sp.	Predator (2)		1		1	2		1	3		1		1	1			1	1		1	2
Tipulidae																					
Antocha sp.	Shredder																				
Dicranota sp.																					
Tipula sp.																					
Simulidae																					
Simulium sp.	Collector/Filterer (6)	1			1																
Culicidae	Collector/Filterer (8)															1	1				
Odonata																					
Gomphidae																					
Gomphus sp.	Predator (6)	6		1	7			8	8					1			1			1	1
Lanthus sp.	Predator																				
Aeshnidae																					
Boyeria sp.	Predator (3)															1	1				
Coenagrionidae																					
Argia sp.	Predator (8)			1	1						2		2		1	2	3			1	1
Enallegma sp.	Predator																				
Macromiidae																					
Macromia sp.	Predator																				
MOLLUSCA:																					
Gastropoda																					
Physidae																					
Physa sp.	Collector/Gatherer (8)	5	1		6	4			4												
Planorbidae	Scraper																				
Pleuroceridae																					
Mudalia sp.	Collector/Gatherer																				
Plecypoda																					
Sphaeridae	Collector/Filterer (8)										6		6								
TOTAL INDIVIDUALS		63	20	16	99	35	43	113	191	25	59	45	129	48	44	36	128	96	24	45	165
TOTAL NUMBER OF TAXA		12	7	9	16	8	9	10	12	6	11	6	11	10	7	8	13	6	4	8	9

TABLE 3
Macroinvertebrate Assemblage in Peak Creek Leaf Packs
on October 31, 2005

TAXA	Functional Feed. Grp.	Station 1	Station 2	Station 3	Station 4	Station 5
ARTHROPODA:						
Insecta						
Megaloptera						
Corydalidae						
Nigronia sp.	Predator				1	
Trichoptera						
Hydropsychidae						
Hydropsyche sp.	Collector/Filterer		2	2	17	
Cheumatopsyche sp.	Collector/Filterer				5	
Diplecrtona sp.	Collector/Filterer					
Philopotamidae						
Chimarra sp.	Collector/Filterer	1	3		2	
Hydroptillidae						
Hydroptila sp.	Scraper					
Limnephilidae	Shredder		1			
Platycentropus sp.	Shredder			1		
Ephemeroptera						
Isonychiidae						
Isonychia sp.	Collector/Filterer		4			
Heptageniidae						
Epeorus sp.	Scraper					
Stenonema sp.	Scraper	3	6			
Baetidae						
Baetis sp.	Scraper					
Siphlonuridae						
Ameletus sp.	Collector/Gatherer					
Siphlonurus sp.	Collector/Gatherer					
Ephemerillidae						
Ephemerella sp.	Scraper					
Drunella sp.	Collector/Gatherer					
Eurylophella sp.	Collector/Gatherer					
Ephemeridae						
Ephemera sp.	Collector/Gatherer					
Plecoptera						
Perlidae						
Acroneuria sp.	Predator		2			
Chloroperlidae						
Haploperla sp.	Shredder					
Taeniopterygidae						
Taeniopteryx sp.	Shredder					
Capniidae						
Allocapnia sp.	Shredder	13	5		9	
Peltoperlidae						
Peltoperla sp.	Shredder		1			
Perlodidae						
Isoperla sp.	Predator				19	
Coleoptera						
Psephenidae						
Psephenus sp.	Scraper	1				
Elmidae				1		
Stenelmis sp.	Scraper					
Diptera						
Chironomidae	Collector/Gatherer	1	1	36	125	5
Tipulidae						
Tipula sp.	Shredder					
Antocha sp.	Shredder					
Simulidae						
Simulium sp.	Collector/Filterer		5			
Odonata						
Aeshnidae						
Aeschna sp.	Predator					
Coenagrionidae						
Argia sp.	Predator			10	1	
Corduliidae						
Corduliinae sp.	Predator				2	
ANNELIDA						
Oligochaeta	Collector/Gatherer					3
MOLLUSCA:						
Corbicula	Collector/Filterer			4	2	
Physidae	Scrapers	1		17		
TOTAL INDIVIDUALS		20	30	71	183	8
TOTAL NUMBER OF TAXA		6	10	7	10	2
TOTAL SHREDDERS		13	7	1	9	0
RATIO SHREDDERS/TOTAL		0.65	0.233333	0.014085	0.04918	0

TABLE 4

GENUS LEVEL ABUNDANCE DISTRIBUTION OF FUNCTIONAL FEEDING GROUPS IN BENTHIC MACROINVERTEBRATE COMMUNITY OF LEAF PACKS IN PEAK CREEK ON OCTOBER 31, 2005

FUNCTIONAL FEEDING GROUP	CPOM (LEAF PACK) SAMPLES - NUMBER OF INDIVIDUALS/GROUP				
	STATION 1	STATION 2	STATION 3	STATON 4	STATION 5
Scrapers	5	6	18	0	0
Gathering - Collectors	1	1	36	125	8
Filtering - Collectors	1	14	6	26	0
Predators	0	2	10	23	0
Shredders	13	7	1	9	0
Total Individuals	20	30	71	183	8

TABLE 5

GENUS LEVEL RICHNESS DISTRIBUTION OF FUNCTIONAL FEEDING GROUPS IN BENTHIC MACROINVERTEBRATE COMMUNITY OF LEAF PACKS IN PEAK CREEK ON OCTOBER 31, 2005

FUNCTIONAL FEEDING GROUP	CPOM (LEAF PACK) SAMPLES - NUMBER OF TAXA/GROUP				
	STATION 1	STATION 2	STATION 3	STATON 4	STATION 5
Scrapers	3	1	2	0	0
Gathering - Collectors	1	1	1	1	2
Filtering - Collectors	1	4	2	4	0
Predators	0	1	1	4	0
Shredders	1	3	1	1	0
Total Families	6	10	7	10	2

TABLE 6

MACROINVERTEBRATE DISTRIBUTION IN PEAK CREEK 2005

PARAMETER	REFERENCE SITES		STUDY SITES		
	STATION 1	STATION 2	STATION 3	STATON 4	STATION 5
Total Number Taxa Collected	16	12	11	13	9
Total Number Macroinvertebrates Collected	99	191	129	128	165
Density[a]	33	64	43	43	55
Diversity[b]	3	2.78	2.54	2.47	1.96
Equitability[c]	0.69	0.83	0.73	0.54	0.56
Community Loss Index (Station 1 Reference)	--	0.42	0.91	0.85	1.00
Community Loss Index (Station 2 Reference)	--	--	0.55	0.45	0.45

[a]Density (number of organisms/0.1 m^2) = total number of organisms collected/3 (number of sites sampled per station).

[b]Diversity = 3.321928/N ($N\log_{10}N$ - $n_i\log_{10}n_i$) where N is the total number of organisms and n is the number of organisms in the n_ith taxon.

[c]Equitability = S'/S where S' is a theoretical value based on diversity and S is the number of taxa collected.

TABLE 12
RAPID BIOASSESSMENT PROTOCOL III STATION 1 REFERENCE
BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2005

STATION NUMBER	REFERENCE SITES				STUDY SITES					
	1		2		3		4		5	
	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness[a]	100%	6	75%	4	69%	4	81%	6	56%	2
HBI (Modified)	100%	6	100%	6	76%	4	76%	4	89%	6
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	17%	0	3%	0	2%	0	12%	0
EPT/Chironomidae Ratio	100%	6	203%	6	27%	2	37%	2	314%	6
% Contribution of Dominant Taxon **(At Genus Level)**[a]	35%	2	38%	2	43%	0	48%	0	50%	0
EPT Richness	100%	6	100%	6	60%	0	60%	0	40%	0
Community Loss Index: (Station 1 Reference)	--	6	0.42	6	0.91	4	0.85	4	1.00	4
Ratio of Shredders/Total[b]	100%	6	176%	6	82%	6	59%	6	0%	0
Total Biological Condition Score	44		36		20		22		18	
Percentage Comparison to Reference	--		82%		45%		50%		41%	
BIOASSESSMENT	Non-impaired		Non-impaired		Moderately Impaired		Moderately Impaired		Moderately Impaired	

[a]Includes some family level data where genus level was not available.
[b]Data based on macroinvertebrate assemblage in leaf pack samples.

TABLE 13
RAPID BIOASSESSMENT PROTOCOL II (Family Level) STATION 1 REFERENCE BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2005

	REFERENCE SITES				STUDY SITES					
	1		2		3		4		5	
STATION NUMBER	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness	100%	6	73%	3	60%	3	73%	3	53%	3
FBI (Modified)	100%	6	105%	6	67%	3	68%	3	81%	3
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	17%	0	3%	0	2%	0	12%	0
EPT/Chironomidae Ratio	100%	6	203%	6	27%	3	37%	3	314%	6
% Contribution of Dominant **Family**	37%	2	41%	3	54%	3	60%	0	50%	3
EPT Index	100%	6	100%	6	50%	0	50%	0	25%	0
Community Loss Index: (Station 1 Reference)	100%	6	0.55	3	1.13	3	0.73	3	1.00	3
Ratio of Shredders/Total[a]	100%	6	176%	6	82%	6	59%	6	0%	0
Total Biological Condition Score	44		33		21		18		18	
Percentage Comparison to Reference	--		75%		48%		41%		41%	
BIOASSESSMENT	Non-impaired		Non-Impaired		Moderately Impaired		Moderately Impaired		Moderately Impaired	

[a] Data based on macroinvertebrate assemblage in leaf pack samples.

TABLE 14
RAPID BIOASSESSMENT PROTOCOL III STATION 2 REFERENCE BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2005

STATION NUMBER	REFERENCE SITE		STUDY SITES					
	2		3		4		5	
	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness[a]	100%	6	92%	6	108%	6	75%	4
HBI (Modified)	100%	6	76%	4	76%	4	89%	6
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	15%	0	11%	0	71%	6
EPT/Chironomidae Ratio	100%	6	14%	0	18%	0	155%	6
% Contribution of Dominant Taxon	38%	2	43%	0	48%	0	50%	0
EPT Index	100%	6	60%	0	60%	0	40%	0
Community Loss Index: (Station 2 Reference)	--	6	0.55	4	0.45	6	0.45	6
Ratio of Shredders/Total[b]		6	47%	4	33%	2	0%	0
Total Biological Condition Score	44		18		18		28	
Percentage Comparison to Reference	--		41%		41%		64%	
BIOASSESSMENT	Non-impaired		Moderately Impaired		Moderately Impaired		Slightly Impaired	

[a] Includes some family level data where genus level was not available.
[b] Data based on macroinvertebrate assemblage in leaf pack samples.

TABLE 15
RAPID BIOASSESSMENT PROTOCOL II (Family Level) STATION 2 REFERENCE BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2005

STATION NUMBER	REFERENCE SITE		STUDY SITES					
	2		3		4		5	
	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness	100%	6	82%	6	100%	6	73%	3
FBI (Modified)	100%	6	64%	3	65%	3	77%	3
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	15%	0	11%	0	71%	6
EPT/Chironomidae Ratio	100%	6	14%	0	18%	0	155%	6
% Contribution of Dominant Taxon	41%	0	54%	0	60%	0	50%	3
EPT Richness	100%	6	50%	0	50%	0	25%	0
Community Loss Index: (Station 2 Reference)	--	6	0.56	3	0.45	3	0.50	3
Ratio of Shredders/Total*	100%	6	47%	3	33%	3	0%	0
Total Biological Condition Score	40		15		15		24	
Percentage Comparison to Reference	--		38%		38%		60%	
BIOASSESSMENT	Non-impaired		Moderately Impaired		Moderately Impaired		Moderately Impaired	

* Data based on macroinvertebrate assemblage in leaf pack samples.

BIOLOGICAL MONITORING REPORT

Stream: Peak Creek Basin: New River Date: October 31, 2005 Location: Vicinity of Magnox-Pulaski Station 1

SENSITIVE		
Stonefly	Capniidae	5
	Chloroperlidae	
	Leuctridae	
	Nemouridae	
	Peltoperlidae	
	Perlidae	
	Perlodidae	
	Pteronarcyidae	
Beetles	Dryopidae	
	Elmidae	22
	Psephenidae	6
Mayfly	Baetiscidae	
	Ephemeridae	
	Heptageniidae	37
	Leptophlebiidae	
	Isonychiidae	
	Potamanthidae	
	Siphlonuridae	
Caddisfly	Brachycentridae	
	Calamoceratidae	
	Glossosomatidae	
	Helicopsychidae	
	Hydroptilidae	
	Lepidostomatidae	
	Leptoceridae	
	Limnephilidae	
	Molannidae	
	Odontoceridae	
	Phryganeidae	
	Philopotamidae	3
	Psychomyiidae	
	Rhyacophilidae	
Sponge	Spongillidae	
Neuroptera	Sisyridae	
Operc. Snail	Pleuroceridae	
	Viviparidae	
Oligochaetes	Branchiobdellidae	1
Mussels	Uniondidae	
Crayfish	Cambaridae	
Watermite	Diplodontidae	
	Hydrachnidae	
	Libertiidae	
	Sperchonidae	
Diptera	Blephariceridae	
	Athericidae	1
TOTAL		75

FACULTATIVE		
Shrimp	Palaemonidae	
Scuds	Gammaridae	
	Talitridae	
Caddisfly	Hydropsychidae	
	Polycentropodidae	
Mayfly	Baetidae	
	Caenidae	
	Ephermerellidae	1
	Tricorythidae	
Limpet	Ancylidae	
Megaloptera	Corydalidae	4
	Sialidae	1
Dragonfly	Aeshnidae	
	Cordulegastridae	
	Corduliidae	
	Gomphidae	7
	Libellulidae	
	Macromiidae	
	Petaluridae	
Damselfly	Calopterygidae	
	Coenagrionidae	1
	Lestidae	
	Protoneuridae	
Sowbug	Asellidae	
Diptera	Chironomidae	3
	Simuliidae	1
	Tipulidae	
Beetles	Chrysomelidae	
	Curculionidae	
	Dytiscidae	
	Gyrinidae	
	Haliplidae	
	Helodidae	
	Hydrophilidae	
	Noteridae	
	Ptilodactylidae	
Hemiptera	Belostomatidae	
	Corixidae	
	Gelastocoridae	
	Gerridae	
	Hebridae	
	Hydrometridae	
	Mesoveliidae	
	Naucoridae	
	Nepidae	
	Notonectidae	
	Veliidae	
Lepidoptera	Pyralidae	
TOTAL		18

TOLERANT		
Diptera	Canaceidae	
	Ceratopogonidae	
	Chaoboridae	
	Cguribinudae	
	Culicidae	
	Dixidae	
	Dolichopohidae	
	Empididae	
	Ephydridae	
	Muscidae	
	Psychodidae	
	Ptychopteridae	
	Sciomyzidae	
	Stratiomyidae	
	Syrphidae	
	Tabanidae	
	Tanyderidae	
Oligochaetes	Enchytraeidae	
	Haplotaxidae	
	Lumbriculidae	
	Naididae	
	Tubificidae	
Non-operc. Snail	Lymnaeidae	
	Physidae	6
	Planobridae	
Flatworms	Dendrocoelidae	
	Planaridae	
Clams	Corbiculidae	
	Sphaeriidae	
Leeches	Erpobdellidae	
	Glossiphoniidae	
	Hirudianidae	
	Piscioludae	
TOTAL		6

BIOLOGICAL MONITORING REPORT

Stream: Peak Creek Basin: New River Date: October 31, 2005 Location: Vicinity of Magnox-Pulaski Station 2

SENSITIVE		
Stonefly	Capniidae	
	Chloroperlidae	
	Leuctridae	
	Nemouridae	
	Peltoperlidae	
	Perlidae	
	Perlodidae	
	Pteronarcyidae	
Beetles	Dryopidae	
	Elmidae	44
	Psephenidae	
Mayfly	Baetiscidae	
	Ephemeridae	
	Heptageniidae	78
	Leptophlebiidae	
	Isonychiidae	33
	Potamanthidae	
	Siphlonuridae	
Caddisfly	Brachycentridae	
	Calamoceratidae	
	Glossosomatidae	
	Helicopsychidae	
	Hydroptilidae	
	Lepidostomatidae	
	Leptoceridae	
	Limnephilidae	
	Molannidae	
	Odontoceridae	
	Phryganeidae	
	Philopotamidae	
	Psychomyiidae	
	Rhyacophilidae	
Sponge	Spongillidae	
Neuroptera	Sisyridae	
Operc. Snail	Pleuroceridae	
	Viviparidae	
Oligochaetes	Branchiobdellidae	
Mussels	Uniondidae	
Crayfish	Cambaridae	
Watermite	Diplodontidae	
	Hydrachnidae	
	Libertiidae	
	Sperchonidae	
Diptera	Blephariceridae	
	Athericidae	3
TOTAL		158

FACULTATIVE		
Shrimp	Palaemonidae	
Scuds	Gammaridae	
	Talitridae	
Caddisfly	Hydropsychidae	10
	Polycentropodidae	
Mayfly	Baetidae	
	Caenidae	
	Ephermerellidae	3
	Tricorythidae	
Limpet	Ancylidae	
Megaloptera	Corydalidae	4
	Sialidae	
Dragonfly	Aeshnidae	
	Cordulegastridae	
	Corduliidae	
	Gomphidae	8
	Libellulidae	
	Macromiidae	
	Petaluridae	
Damselfly	Calopterygidae	
	Coenagrionidae	
	Lestidae	
	Protoneuridae	
Sowbug	Asellidae	
Diptera	Chironomidae	4
	Simuliidae	
	Tipulidae	
Beetles	Chrysomelidae	
	Curculionidae	
	Dytiscidae	
	Gyrinidae	
	Haliplidae	
	Helodidae	
	Hydrophilidae	
	Noteridae	
	Ptilodactylidae	
Hemiptera	Belostomatidae	
	Corixidae	
	Gelastocoridae	
	Gerridae	
	Hebridae	
	Hydrometridae	
	Mesoveliidae	
	Naucoridae	
	Nepidae	
	Notonectidae	
	Veliidae	
Lepidoptera	Pyralidae	
TOTAL		29

TOLERANT		
Diptera	Canaceidae	
	Ceratopogonidae	
	Chaoboridae	
	Cguribinudae	
	Culicidae	
	Dixidae	
	Dolichopohidae	
	Empididae	
	Ephydridae	
	Muscidae	
	Psychodidae	
	Ptychopteridae	
	Sciomyzidae	
	Stratiomyidae	
	Syrphidae	
	Tabanidae	
	Tanyderidae	
Oligochaetes	Enchytraeidae	
	Haplotaxidae	
	Lumbriculidae	
	Naididae	
	Tubificidae	
Non-operc. Snail	Lymnaeidae	
	Physidae	4
	Planobridae	
Flatworms	Dendrocoelidae	
	Planaridae	
Clams	Corbiculidae	
	Sphaeriidae	
Leeches	Erpobdellidae	
	Glossiphoniidae	
	Hirudianidae	
	Pisciolidae	
TOTAL		4

BIOLOGICAL MONITORING REPORT

Stream: Peak Creek Basin: New River Date: October 31, 2005 Location: Vicinity of Magnox-Pulaski Station 3

SENSITIVE

Stonefly	Capniidae	
	Chloroperlidae	
	Leuctridae	
	Nemouridae	
	Peltoperlidae	
	Perlidae	1
	Perlodidae	
	Pteronarcyidae	
Beetles	Dryopidae	
	Elmidae	18
	Psephenidae	10
Mayfly	Baetiscidae	
	Ephemeridae	
	Heptageniidae	
	Leptophlebiidae	
	Isonychiidae	
	Potamanthidae	
	Siphlonuridae	
Caddisfly	Brachycentridae	
	Calamoceratidae	
	Glossosomatidae	
	Helicopsychidae	
	Hydroptilidae	
	Lepidostomatidae	
	Leptoceridae	
	Limnephilidae	
	Molannidae	
	Odontoceridae	
	Phryganeidae	
	Philopotamidae	
	Psychomyiidae	
	Rhyacophilidae	
Sponge	Spongillidae	
Neuroptera	Sisyridae	
Operc. Snail	Pleuroceridae	
	Viviparidae	
Oligochaetes	Branchiobdellidae	
Mussels	Uniondidae	
Crayfish	Cambaridae	
Watermite	Diplodontidae	
	Hydrachnidae	
	Libertiidae	
	Sperchonidae	
Diptera	Blephariceridae	
	Athericidae	1
TOTAL		30

FACULTATIVE

Shrimp	Palaemonidae	
Scuds	Gammaridae	
	Talitridae	
Caddisfly	Hydropsychidae	70
	Polycentropodidae	
Mayfly	Baetidae	
	Caenidae	
	Ephermerellidae	
	Tricorythidae	
Limpet	Ancylidae	
Megaloptera	Corydalidae	4
	Sialidae	
Dragonfly	Aeshnidae	
	Cordulegastridae	
	Corduliidae	
	Gomphidae	
	Libellulidae	
	Macromiidae	
	Petaluridae	
Damselfly	Calopterygidae	
	Coenagrionidae	2
	Lestidae	
	Protoneuridae	
Sowbug	Asellidae	
Diptera	Chironomidae	17
	Simuliidae	
	Tipulidae	
Beetles	Chrysomelidae	
	Curculionidae	
	Dytiscidae	
	Gyrinidae	
	Haliplidae	
	Helodidae	
	Hydrophilidae	
	Noteridae	
	Ptilodactylidae	
Hemiptera	Belostomatidae	
	Corixidae	
	Gelastocoridae	
	Gerridae	
	Hebridae	
	Hydrometridae	
	Mesoveliidae	
	Naucoridae	
	Nepidae	
	Notonectidae	
	Veliidae	
Lepidoptera	Pyralidae	
TOTAL		93

TOLERANT

Diptera	Canaceidae	
	Ceratopogonidae	
	Chaoboridae	
	Cguribmudae	
	Culicidae	
	Dixidae	
	Dolichopohidae	
	Empididae	
	Ephydridae	
	Muscidae	
	Psychodidae	
	Ptychopteridae	
	Sciomyzidae	
	Stratiomyidae	
	Syrphidae	
	Tabanidae	
	Tanyderidae	
Oligochaetes	Enchytraeidae	
	Haplotaxidae	
	Lumbriculidae	
	Naididae	
	Tubificidae	
Non-operc. Snail	Lymnaeidae	
	Physidae	
	Planobridae	
Flatworms	Dendrocoelidae	
	Planaridae	
Clams	Corbiculidae	
	Sphaeriidae	6
Leeches	Erpobdellidae	
	Glossiphoniidae	
	Hirudianidae	
	Pisciolidae	
TOTAL		6

BIOLOGICAL MONITORING REPORT

Stream: Peak Creek   Basin: New River   Date: October 31, 2005   Location: Vicinity of Magnox-Pulaski Station 4

SENSITIVE

Stonefly	Capniidae	
	Chloroperlidae	
	Leuctridae	
	Nemouridae	
	Peltoperlidae	
	Perlidae	3
	Perlodidae	
	Pteronarcyidae	
Beetles	Dryopidae	
	Elmidae	17
	Psephenidae	7
Mayfly	Baetiscidae	
	Ephemeridae	
	Heptageniidae	
	Leptophlebiidae	
	Isonychiidae	
	Potamanthidae	
	Siphlonuridae	
Caddisfly	Brachycentridae	
	Calamoceratidae	
	Glossosomatidae	
	Helicopsychidae	
	Hydroptilidae	
	Lepidostomatidae	
	Leptoceridae	
	Limnephilidae	
	Molannidae	
	Odontoceridae	
	Phryganeidae	
	Philopotamidae	
	Psychomyiidae	
	Rhyacophilidae	
Sponge	Spongillidae	
Neuroptera	Sisyridae	
Operc. Snail	Pleuroceridae	
	Viviparidae	
Oligochaetes	Branchiobdellidae	
Mussels	Uniondidae	
Crayfish	Cambaridae	
Watermite	Diplodontidae	
	Hydrachnidae	
	Libertiidae	
	Sperchonidae	
Diptera	Blephariceridae	
	Athericidae	1
TOTAL		28

FACULTATIVE

Shrimp	Palaemonidae	
Scuds	Gammaridae	
	Talitridae	
Caddisfly	Hydropsychidae	77
	Polycentropodidae	
Mayfly	Baetidae	
	Caenidae	
	Ephermerellidae	
	Tricorythidae	
Limpet	Ancylidae	
Megaloptera	Corydalidae	3
	Sialidae	
Dragonfly	Aeshnidae	1
	Cordulegastridae	
	Corduliidae	
	Gomphidae	1
	Libellulidae	
	Macromiidae	
	Petaluridae	
Damselfly	Calopterygidae	
	Coenagrionidae	3
	Lestidae	
	Protoneuridae	
Sowbug	Asellidae	
Diptera	Chironomidae	14
	Simuliidae	
	Tipulidae	
Beetles	Chrysomelidae	
	Curculionidae	
	Dytiscidae	
	Gyrinidae	
	Haliplidae	
	Helodidae	
	Hydrophilidae	
	Noteridae	
	Ptilodactylidae	
Hemiptera	Belostomatidae	
	Corixidae	
	Gelastocoridae	
	Gerridae	
	Hebridae	
	Hydrometridae	
	Mesoveliidae	
	Naucoridae	
	Nepidae	
	Notonectidae	
	Veliidae	
Lepidoptera	Pyralidae	
TOTAL		99

TOLERANT

Diptera	Canaceidae	
	Ceratopogonidae	
	Chaoboridae	
	Cguribinudae	
	Culicidae	1
	Dixidae	
	Dolichopohidae	
	Empididae	
	Ephydridae	
	Muscidae	
	Psychodidae	
	Ptychopteridae	
	Sciomyzidae	
	Stratiomyidae	
	Syrphidae	
	Tabanidae	
	Tanyderidae	
Oligochaetes	Enchytraeidae	
	Haplotaxidae	
	Lumbriculidae	
	Naididae	
	Tubificidae	
Non-operc. Snail	Lymnaeidae	
	Physidae	
	Planobridae	
Flatworms	Dendrocoelidae	
	Planaridae	
Clams	Corbiculidae	
	Sphaeriidae	
Leeches	Erpobdellidae	
	Glossiphoniidae	
	Hirudianidae	
	Pisciolidae	
TOTAL		1

BIOLOGICAL MONITORING REPORT

Stream: Peak Creek Basin: New River Date: October 31, 2005 Location: Vicinity of Magnox-Pulaski Station 5

SENSITIVE

Stonefly	Capniidae	
	Chloroperlidae	
	Leuctridae	
	Nemouridae	
	Peltoperlidae	
	Perlidae	
	Perlodidae	
	Pteronarcyidae	
Beetles	Dryopidae	
	Elmidae	82
	Psephenidae	28
Mayfly	Baetiscidae	
	Ephemeridae	
	Heptageniidae	
	Leptophlebiidae	
	Isonychiidae	
	Potamanthidae	
	Siphlonuridae	
Caddisfly	Brachycentridae	
	Calamoceratidae	
	Glossosomatidae	
	Helicopsychidae	
	Hydroptilidae	
	Lepidostomatidae	
	Leptoceridae	
	Limnephilidae	
	Molannidae	
	Odontoceridae	
	Phryganeidae	
	Philopotamidae	
	Psychomyiidae	
	Rhyacophilidae	
Sponge	Spongillidae	
Neuroptera	Sisyridae	
Operc. Snail	Pleuroceridae	
	Viviparidae	
Oligochaetes	Branchiobdellidae	
Mussels	Uniondidae	
Crayfish	Cambaridae	
Watermite	Diplodontidae	
	Hydrachnidae	
	Libertiidae	
	Sperchonidae	
Diptera	Blephariceridae	
	Athericidae	2
TOTAL		**112**

FACULTATIVE

Shrimp	Palaemonidae	
Scuds	Gammaridae	
	Talitridae	
Caddisfly	Hydropsychidae	48
	Polycentropodidae	
Mayfly	Baetidae	
	Caenidae	
	Ephermerellidae	
	Tricorythidae	
Limpet	Ancylidae	
Megaloptera	Corydalidae	2
	Sialidae	
Dragonfly	Aeshnidae	
	Cordulegastridae	
	Corduliidae	
	Gomphidae	1
	Libellulidae	
	Macromiidae	
	Petaluridae	
Damselfly	Calopterygidae	
	Coenagrionidae	1
	Lestidae	
	Protoneuridae	
Sowbug	Asellidae	
Diptera	Chironomidae	1
	Simuliidae	
	Tipulidae	
Beetles	Chrysomelidae	
	Curculionidae	
	Dytiscidae	
	Gyrinidae	
	Haliplidae	
	Helodidae	
	Hydrophilidae	
	Noteridae	
	Ptilodactylidae	
Hemiptera	Belostomatidae	
	Corixidae	
	Gelastocoridae	
	Gerridae	
	Hebridae	
	Hydrometridae	
	Mesoveliidae	
	Naucoridae	
	Nepidae	
	Notonectidae	
	Veliidae	
Lepidoptera	Pyralidae	
TOTAL		**53**

TOLERANT

Diptera	Canaceidae	
	Ceratopogonidae	
	Chaoboridae	
	Cguribinudae	
	Culicidae	
	Dixidae	
	Dolichopohidae	
	Empididae	
	Ephydridae	
	Muscidae	
	Psychodidae	
	Ptychopteridae	
	Sciomyzidae	
	Stratiomyidae	
	Syrphidae	
	Tabanidae	
	Tanyderidae	
Oligochaetes	Enchytraeidae	
	Haplotaxidae	
	Lumbriculidae	
	Naididae	
	Tubificidae	
Non-operc. Snail	Lymnaeidae	
	Physidae	
	Planobridae	
Flatworms	Dendrocoelidae	
	Planaridae	
Clams	Corbiculidae	
	Sphaeriidae	
Leeches	Erpobdellidae	
	Glossiphoniidae	
	Hirudianidae	
	Pisciolidae	
TOTAL		**0**

TABLE 2
Macroinvertebrate
Assemblage in Peak Creek
on August 22, 2006

TAXA	Functional Feeding Group (Tolerance Values)	STATION 1				STATION 2				STATION 3				STATION 4				STATION 5			
		Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total
ANNELIDA:																					
Oligochaeta																					
Brachiodellidae	Collector/Gatherer (8)					9			9		1		1			2	2	1			1
Insecta																					
Megaloptera																					
Corydalidae																					
Corydalus sp.	Predator (5)		1	1	2																
Nigronia sp.	Predator (4)			2	2	1	1	2	4		1		1	1			1				
Sialidae																					
Sialis latreille	Predator (7)																				
Trichoptera																					
Hydropsychidae																					
Hydropsyche sp.	Collector/Filterer (6)		1		1		5	4	9	6	5	2	13	20	3	9	32	6	5	19	30
Cheumatopsyche sp.	Collector/Filterer (6)						1		1												
Diplectrona sp.	Collector/Filterer																				
Philopotamidae																					
Chimarra sp.	Collector/Filterer (3)						7	1	8					1			1				
Hydroptilidae																					
Hydroptilla sp.	Scraper																				
Helicopsychidae																					
Helicopsyche sp.	Scraper																				
Limnephilidae				1	1																
Apatania sp.																					
Platycentropus sp.																					
Neophylax sp.	Scraper																				
Goera sp.	Scraper																				
Goerita sp.																					
Psychomyiidae																					
psychomyia	Collector/Gatherer (3)	2			2																
Ephemeroptera																					
Isonychiidae																					
Isonychia sp.	Collector/Filterer (3)		4	1	5			3	3					2		1	3				
Heptageniidae																					
Stenacron sp.	Collector/Gatherer (4)		5		5	9			9												
Stenonema sp.	Scraper (4)	8	9	7	24	5	8	7	20												
Baetidae																					
Baetis sp.	Scraper																				
Caenidae																					
Caenis sp.	Collector/Gatherer																				
Siphlonuridae																					
Siphlonurus sp.	Collector/Gatherer																				
Ameletus sp.	Collector/Gatherer																				
Ephemerellidae																					
Eurylophella sp.	Collector/Gatherer (4)	2	1	2	5	4	2	1	7			1	1								
Plecoptera																					
Perlidae																					
Acroneuria sp.	Predator (2)																				
Perlesta sp.	Predator																				
Paragenita sp.																					
Chloroperlidae																					
Haploperla sp.																					
Taeniopterygidae																					
Taeniopteryx sp.	Shredder																				
Capniidae																					
Allocapnia sp.	Shredder (1)		1		1			2	2												

TABLE 2
Macroinvertebrate
Assemblage in Peak Creek
on August 22, 2006

TAXA	Functional Feeding Group (Tolerance Values)	STATION 1				STATION 2				STATION 3				STATION 4				STATION 5			
		Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total	Site 1	Site 2	Site 3	Total
Coleoptera																					
Psephenidae																					
Psephenus sp.	Scraper (4)	2	3	2	7	7	5		12			1	1	3	6		9	1	5	5	11
Elmidae	Scraper (4)		1		1									1			1	1		1	2
Stenelmis sp.	Scraper (5)																				
Optioservus sp.	Scraper (5)																				
Hydrophilidae																					
Diptera																					
Chironomidae	Collector/Gatherer (6)	2		3	5	6			6	3	4	1	8		1	2	3		7	4	11
Athericidae																					
Atherix sp.	Predator (2)																				
Tipulidae																					
Antocha sp.	Shredder																				
Dicranota sp.																					
Tipula sp.																					
Simulidae																					
Simulium sp.	Collector/Filterer (6)						1		1												
Empidiae	Predator																				
Culicidae	Collector/Filterer (8)																			1	1
Odonata																					
Gomphidae																					
Gomphus sp.	Predator (6)	2		1	3	4	1		5					1		2	3				
Lanthus sp.	Predator																				
Aeshnidae																					
Boyeria sp.	Predator (3)		1		1	1			1							1	1				
Coenagrionidae																					
Argia sp.	Predator (8)		2	1	3	3	1	1	5						1		1				
Enallegma sp.	Predator																				
Macromiidae																					
Macromia sp.	Predator																				
MOLLUSCA:																					
Gastropoda																					
Physidae																					
Physa sp.	Collector/Gatherer (8)																				
Planorbidae	Scraper	1			1																
Pleuroceridae		15	1		16	2	12		14					1	1		2			7	7
Mudalia sp.	Collector/Gatherer																				
Plecypoda																					
Sphaeridae	Collector/Filterer (8)					2			2		2		2						1	1	2
TOTAL INDIVIDUALS		34	30	21	85	53	44	21	118	9	13	5	27	30	12	17	59	9	18	38	65
TOTAL NUMBER OF TAXA		8	12	10	18	12	11	8	18	2	5	4	7	8	5	6	12	4	4	7	8

TABLE 3
Macroinvertebrate Assemblage in Peak Creek Leaf Packs
on August 22, 2006

TAXA	Functional Feed. Grp.	Station 1	Station 2	Station 3	Station 4	Station 5
ARTHROPODA:						
Insecta						
Megaloptera						
Corydalidae						
Corydalus sp.	Predator			1		
Trichoptera						
Hydropsychidae						
Hydropsyche sp.	Collector/Filterer	3	4	32	4	1
Cheumatopsyche sp.	Collector/Filterer			1		
Diplecrtona sp.	Collector/Filterer					
Philopotamidae						
Chimarra sp.	Collector/Filterer	6	19	34		
Hydroptillidae						
Hydroptila sp.	Scraper					
Limnephilidae	Shredder		1			
Platycentropus sp.	Shredder					
Ephemeroptera						
Isonychiidae						
Isonychia sp.	Collector/Filterer	2		2		
Heptageniidae						
Epeorus sp.	Scraper		5			
Stenonema sp.	Scraper	11	2	3		
Baetidae						
Baetis sp.	Scraper		2	2		
Siphlonuridae						
Ameletus sp.	Collector/Gatherer					
Siphlonurus sp.	Collector/Gatherer					
Ephemerillidae						
Ephemerella sp.	Scraper					
Drunella sp.	Collector/Gatherer					
Eurylophella sp.	Collector/Gatherer					
Ephemeridae						
Ephemera sp.	Collector/Gatherer					
Plecoptera						
Perlidae						
Acroneuria sp.	Predator	3	4	1		
Chloroperlidae						
Haploperla sp.	Shredder					
Taeniopterygidae						
Taeniopteryx sp.	Shredder					
Capniidae						
Allocapnia sp.	Shredder	2	2	1		1
Peltoperlidae						
Peltoperla sp.	Shredder					
Perlodidae						
Isoperla sp.	Predator					
Coleoptera						
Psephenidae						
Psephenus sp.	Scraper	1				
Elmidae						
Stenelmis sp.	Scraper	1		2	1	
Diptera						
Chironomidae	Collector/Gatherer	23	2	52	40	5
Tipulidae						
Tipula sp.	Shredder					
Antocha sp.	Shredder					
Simulidae						
Simulium sp.	Collector/Filterer	11	82	46	7	1
Empididae	Predator			1		
Odonata						
Aeshnidae						
Boyeria sp.	Predator			1	2	
Coenagrionidae						
Argia sp.	Predator			1		
Corduliidae						
Corduliinae sp.	Predator					
ANNELIDA						
Oligochaeta	Collector/Gatherer					
MOLLUSCA:						
Corbicula	Collector/Filterer					
Pleurocendae						
Physidae	Scrapers					
TOTAL INDIVIDUALS		63	123	180	54	8
TOTAL NUMBER OF TAXA		10	10	15	5	4
TOTAL SHREDDERS		2	3	1	0	1
RATIO SHREDDERS/TOTAL		0.031746	0.02439	0.005556	0	0.125

TABLE 12
RAPID BIOASSESSMENT PROTOCOL III STATION 1 REFERENCE BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2006

STATION NUMBER	REFERENCE SITES				STUDY SITES					
	1		2		3		4		5	
	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness[a]	100%	6	100%	6	41%	2	71%	4	47%	2
HBI (Modified)	100%	6	124%	6	287%	6	145%	6	169%	6
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	24%	2	1%	0	5%	0	7%	0
EPT/Chironomidae Ratio	100%	6	110%	6	20%	0	140%	6	32%	2
% Contribution of Dominant Taxon **(At Genus Level)**[a]	29%	2	17%	6	48%	0	54%	0	46%	0
EPT Richness	100%	6	100%	6	29%	0	43%	0	14%	0
Community Loss Index: (Station 1 Reference)	--	6	0.29	6	1.71	2	0.58	4	1.50	4
Ratio of Shredders/Total[b]	100%	6	67%	6	33%	2	0%	0	433%	6
Total Biological Condition Score	44		44		12		20		20	
Percentage Comparison to Reference	--		100%		27%		45%		45%	
BIOASSESSMENT	Non-impaired		Non-impaired		Moderately impaired		Moderately impaired		Moderately impaired	

[a]Includes some family level data where genus level was not available.
[b]Data based on macroinvertebrate assemblage in leaf pack samples.

TABLE 13
RAPID BIOASSESSMENT PROTOCOL II (Family Level) STATION 1 REFERENCE BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2006

	REFERENCE SITES				STUDY SITES					
	1		2		3		4		5	
STATION NUMBER	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness	100%	6	73%	3	60%	3	73%	3	53%	3
FBI (Modified)	100%	6	124%	6	289%	6	146%	6	173%	6
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	24%	0	1%	0	5%	0	7%	0
EPT/Chironomidae Ratio	100%	6	110%	6	20%	0	140%	6	32%	3
% Contribution of Dominant **Family**	35%	2	25%	6	48%	3	54%	0	46%	3
EPT Index	100%	6	83%	3	17%	0	50%	0	17%	0
Community Loss Index: (Station 1 Reference)	100%	6	0.27	6	1.43	3	0.42	6	1.25	3
Ratio of Shredders/Total[a]	100%	6	67%	6	33%	3	0%	0	433%	6
Total Biological Condition Score	44		36		18		21		24	
Percentage Comparison to Reference	--		82%		41%		48%		55%	
BIOASSESSMENT	Non-impaired		Non-impaired		Moderately impaired		Moderately impaired		Moderately impaired	

[a] Data based on macroinvertebrate assemblage in leaf pack samples.

TABLE 14
RAPID BIOASSESSMENT PROTOCOL III STATION 2 REFERENCE BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2006

STATION NUMBER	REFERENCE SITE		STUDY SITES					
	2		3		4		5	
	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness[a]	100%	6	41%	2	71%	4	47%	2
HBI (Modified)	100%	6	231%	6	117%	6	136%	6
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	5%	0	21%	2	29%	2
EPT/Chironomidae Ratio	100%	6	18%	0	126%	6	29%	2
% Contribution of Dominant Taxon	17%	2	48%	0	54%	0	45%	0
EPT Index	100%	6	29%	0	43%	0	14%	0
Community Loss Index: (Station 2 Reference)	--	6	1.43	4	0.50	6	1.34	4
Ratio of Shredders/Total[b]		6	50%	6	0%	0	650%	6
Total Biological Condition Score	44		18		24		22	
Percentage Comparison to Reference	--		41%		55%		50%	
BIOASSESSMENT	Non-impaired		Moderately impaired		Slightly impaired		Moderately impaired	

[a] Includes some family level data where genus level was not available.
[b] Data based on macroinvertebrate assemblage in leaf pack samples.

TABLE 15
RAPID BIOASSESSMENT PROTOCOL II (Family Level) STATION 2 REFERENCE BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2006

STATION NUMBER	REFERENCE SITE		STUDY SITES					
	2		3		4		5	
	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness	100%	6	82%	6	100%	6	73%	3
FBI (Modified)	100%	6	233%	6	118%	6	140%	6
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	5%	0	21%	0	29%	3
EPT/Chironomidae Ratio	100%	6	18%	0	126%	6	29%	3
% Contribution of Dominant Taxon	25%	0	48%	3	54%	0	46%	3
EPT Index	100%	6	20%	0	60%	0	20%	0
Community Loss Index: (Station 2 Reference)	--	6	1.14	3	0.33	6	1.13	3
Ratio of Shredders/Total*	100%	6	50%	6	0%	0	650%	6
Total Biological Condition Score	40		24		24		27	
Percentage Comparison to Reference	--		60%		60%		68%	
BIOASSESSMENT	Non-impaired		Moderately impaired		Moderately impaired		Moderately impaired	

* Data based on macroinvertebrate assemblage in leaf pack samples.

TABLE 16

COMPARISON OF NUMBER OF INDIVIDUALS COLLECTED DURING STUDY YEARS

STUDY YEAR	REFERENCE SITES		STUDY SITES			
	STATION 1	STATION 2	STATION 3	STATION 4	STATION 5	STATION 6
1997	2542	1634	930	1784	1098	559
1998	574	514	1281	818	1066	461
2000	738	410	611	859	666	*
2001	556	108	584	302	278	*
2002	235	168	746	203	198	*
2003	290	93	185	289	132	*
2005	99	191	129	128	165	*
2006	84	116	27	59	65	*

* The original Station 5 was eliminated for the studies conducted in 2000 and 2001. The Station 6 location was renamed Station 5 for these events.

TABLE 12
RAPID BIOASSESSMENT PROTOCOL III STATION 1 REFERENCE
BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2007

STATION NUMBER	REFERENCE SITES				STUDY SITES					
	1		2		3		4		5	
	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness[a]	100%	6	88%	6	75%	4	63%	4	63%	4
HBI (Modified)	100%	6	111%	6	90%	6	90%	6	92%	6
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	66%	6	10%	0	5%	0	30%	2
EPT/Chironomidae Ratio	100%	6	470%	6	28%	0	114%	6	63%	4
% Contribution of Dominant Taxon **(At Genus Level)**[a]	26%	2	28%	2	78%	0	90%	0	79%	0
EPT Richness	100%	6	100%	6	60%	0	60%	0	60%	0
Community Loss Index: (Station 1 Reference)	--	6	0.29	6	0.58	4	0.90	4	0.70	4
Ratio of Shredders/Total[b]	100%	6	40%	2	0%	0	0%	0	20%	0
Total Biological Condition Score	44		40		14		20		20	
Percentage Comparison to Reference	--		91%		32%		45%		45%	
BIOASSESSMENT	Non-impaired		Non-impaired		Moderately impaired		Moderately impaired		Moderately impaired	

[a]Includes some family level data where genus level was not available.
[b]Data based on macroinvertebrate assemblage in leaf pack samples.

TABLE 13
RAPID BIOASSESSMENT PROTOCOL II (Family Level) STATION 1 REFERENCE BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2007

STATION NUMBER	REFERENCE SITES				STUDY SITES					
	1		2		3		4		5	
	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness	100%	6	86%	6	86%	6	71%	3	64%	3
FBI (Modified)	100%	6	111%	6	90%	6	90%	6	92%	6
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	66%	3	10%	0	5%	0	30%	3
EPT/Chironomidae Ratio	100%	6	470%	6	28%	3	114%	6	63%	3
% Contribution of Dominant Family	35%	2	28%	3	78%	0	90%	0	79%	0
EPT Index	100%	6	100%	6	75%	3	75%	3	75%	3
Community Loss Index: (Station 1 Reference)	100%	6	0.25	6	0.33	6	0.60	3	0.55	3
Ratio of Shredders/Total[a]	100%	6	40%	6	0%	0	0%	0	0%	0
Total Biological Condition Score	44		42		24		21		21	
Percentage Comparison to Reference	--		95%		54%		48%		48%	
BIOASSESSMENT	Non-impaired		Non-impaired		Moderately impaired		Moderately impaired		Moderately impaired	

[a] Data based on macroinvertebrate assemblage in leaf pack samples.

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TABLE 14
RAPID BIOASSESSMENT PROTOCOL III STATION 2 REFERENCE BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2007

STATION NUMBER	REFERENCE SITE		STUDY SITES					
	2		3		4		5	
	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness[a]	100%	6	86%	6	71%	4	71%	4
HBI (Modified)	100%	6	81%	6	80%	6	83%	6
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	15%	0	8%	0	45%	4
EPT/Chironomidae Ratio	100%	6	6%	0	24%	2	13%	0
% Contribution of Dominant Taxon	28%	2	78%	0	90%	0	79%	0
EPT Index	100%	6	60%	0	60%	0	60%	0
Community Loss Index: (Station 2 Reference)	--	6	0.50	6	0.70	4	0.70	4
Ratio of Shredders/Total[b]	--	6	0%	0	0%	0	20%	0
Total Biological Condition Score	44		18		16		18	
Percentage Comparison to Reference	--		41%		36%		41%	
BIOASSESSMENT	Non-impaired		Moderately impaired		Moderately impaired		Moderately impaired	

[a] Includes some family level data where genus level was not available.
[b] Data based on macroinvertebrate assemblage in leaf pack samples.

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TABLE 15
RAPID BIOASSESSMENT PROTOCOL II (Family Level) STATION 2 REFERENCE
BIOLOGICAL CONDITION SCORING AND BIOASSESSMENT 2007

STATION NUMBER	REFERENCE SITE		STUDY SITES					
	2		3		4		5	
	% Comp.	Score	% Comp.	Score	% Comp.	Score	% Comp.	Score
Taxa Richness	100%	6	100%	6	83%	6	75%	3
FBI (Modified)	100%	6	81%	3	81%	3	83%	6
Functional Feeding Groups: Ratio of Scrapers/ Filtering Collectors	100%	6	15%	0	8%	0	45%	3
EPT/Chironomidae Ratio	100%	6	6%	0	24%	3	13%	0
% Contribution of Dominant Taxon	28%	3	78%	0	90%	0	79%	0
EPT Index	100%	6	75%	3	75%	3	75%	3
Community Loss Index: (Station 2 Reference)	--	6	0.33	6	0.50	3	0.67	3
Ratio of Shredders/Total*	100%	6	0%	0	0%	0	20%	0
Total Biological Condition Score	45		18		18		18	
Percentage Comparison to Reference	--		40%		40%		40%	
BIOASSESSMENT	Non-impaired		Moderately impaired		Moderately impaired		Moderately impaired	

* Data based on macroinvertebrate assemblage in leaf pack samples.

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TABLE 16

COMPARISON OF NUMBER OF INDIVIDUALS COLLECTED DURING STUDY YEARS

STUDY YEAR	REFERENCE SITES		STUDY SITES			
	STATION 1	STATION 2	STATION 3	STATION 4	STATION 5	STATION 6
1997	2,542	1,634	930	1,784	1,098	559
1998	574	514	1,281	818	1,066	461
2000	738	410	611	859	666	*
2001	556	108	584	302	278	*
2002	235	168	746	203	198	*
2003	290	93	185	289	132	*
2005	99	191	129	128	165	*
2006	84	116	27	59	65	*
2007	155	290	213	308	155	*

* The original Station 5 was eliminated for the studies conducted in 2000 and 2001. The Station 6 location was renamed Station 5 for these events.

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BIOLOGICAL MONITORING REPORT

Stream: Peak Creek Basin: New River Date: September 26, 2007 Location: Vicinity of Nanochemonics Station 1

SENSITIVE		
Stonefly	Capniidae	
	Chloroperlidae	
	Leuctridae	
	Nemouridae	
	Peltoperlidae	
	Perlidae	
	Perlodidae	
	Pternarcyidae	
Beetles	Dryopidae	
	Elmidae	6
	Psephenidae	7
Mayfly	Baetiscidae	
	Ephemeridae	
	Heptageniidae	36
	Leptophlebiidae	
	Isonychiidae	16
	Potamanthidae	
	Siphlonuridae	
Caddisfly	Brachycentridae	
	Calamoceratidae	
	Glossosomatidae	
	Helicopsychidae	
	Hydroptilidae	
	Lepidostomatidae	
	Leptoceridae	
	Limnephilidae	
	Molannidae	
	Odontoceridae	
	Phryganeidae	
	Philopotamidae	7
	Psychomyiidae	
	Rhyacophilidae	
Sponge	Spongillidae	
Neuroptera	Sisyridae	
Operc. Snail	Pleuroceridae	26
	Viviparidae	
Oligochaetes	Branchiobdellidae	
Mussels	Unionidae	
Crayfish	Cambaridae	
Watermite	Diplodontidae	
	Hydrachnidae	
	Libertiidae	
	Sperchonidae	
Diptera	Blephariceridae	
	Athericidae	
TOTAL		98

FACULTATIVE		
Shrimp	Palaemonidae	
Scuds	Gammaridae	
	Talitridae	
Caddisfly	Hydropsychidae	41
	Polycentropodidae	
Mayfly	Baetidae	
	Caenidae	
	Ephermerellidae	
	Tricorythidae	
Limpet	Ancylidae	
Megaloptera	Corydalidae	2
	Sialidae	1
Dragonfly	Aeshnidae	1
	Cordulegastridae	
	Corduliidae	
	Gomphidae	3
	Libellulidae	
	Macromiidae	
	Petaluridae	
Damselfly	Calopterygidae	
	Coenagrionidae	1
	Lestidae	
	Protoneuridae	
Sowbug	Asellidae	
Diptera	Chironomidae	2
	Simuliidae	6
	Tipulidae	
Beetles	Chrysomelidae	
	Curculionidae	
	Dytiscidae	
	Gyrinidae	
	Haliplidae	
	Helodidae	
	Hydrophilidae	
	Noteridae	
	Ptilodactylidae	
Hemiptera	Belostomatidae	
	Corixidae	
	Gelastocoridae	
	Gerridae	
	Hebridae	
	Hydrometridae	
	Mesoveliidae	
	Naucoridae	
	Nepidae	
	Notonectidae	
	Veliidae	
Lepidoptera	Pyralidae	
TOTAL		57

TOLERANT		
Diptera	Canaceidae	
	Ceratopogonidae	
	Chaoboridae	
	Cguribinudae	
	Culicidae	
	Dixidae	
	Dolichopohidae	
	Empididae	
	Ephydridae	
	Muscidae	
	Psychodidae	
	Ptychopteridae	
	Sciomyzidae	
	Stratiomyidae	
	Syrphidae	
	Tabanidae	
	Tanyderidae	
Oligochaetes	Enchytraeidae	
	Haplotaxidae	
	Lumbriculidae	
	Naididae	
	Tubificidae	
Non-operc. Snail	Lymnaeidae	
	Physidae	
	Planorbidae	
Flatworms	Dendrocoelidae	
	Planaridae	
Clams	Corbiculidae	
	Sphaeriidae	
Leeches	Erpobdellidae	
	Glossiphoniidae	
	Hirudinidae	
	Piscicolidae	
TOTAL		0

BIOLOGICAL MONITORING REPORT

Stream: Peak Creek Basin: New River Date: September 26, 2007 Location: Vicinity of Nanochemonics Station 2

SENSITIVE		
Stonefly	Capniidae	
	Chloroperlidae	
	Leuctridae	
	Nemouridae	
	Peltoperlidae	
	Perlidae	
	Perlodidae	
	Pteronarcyidae	
Beetles	Dryopidae	
	Elmidae	1
	Psephenidae	9
Mayfly	Baetiscidae	
	Ephemeridae	
	Heptageniidae	68
	Leptophlebiidae	
	Isonychiidae	73
	Potamanthidae	
	Siphlonuridae	
Caddisfly	Brachycentridae	
	Calamoceratidae	
	Glossosomatidae	
	Helicopsychidae	
	Hydroptilidae	
	Lepidostomatidae	
	Leptoceridae	
	Limnephilidae	
	Molannidae	
	Odontoceridae	
	Phryganeidae	
	Philopotamidae	12
	Psychomyiidae	
	Rhyacophilidae	
Sponge	Spongillidae	
Neuroptera	Sisyridae	
Operc. Snail	Pleuroceridae	27
	Viviparidae	
Oligochaetes	Branchiobdellidae	
Mussels	Uniondidae	
Crayfish	Cambaridae	
Watermite	Diplodontidae	
	Hydrachnidae	
	Libertiidae	
	Sperchonidae	
Diptera	Blephariceridae	
	Athericidae	1
TOTAL		**191**

FACULTATIVE		
Shrimp	Palaemonidae	
Scuds	Gammaridae	
	Talitridae	
Caddisfly	Hydropsychidae	82
	Polycentropodidae	
Mayfly	Baetidae	
	Caenidae	
	Ephemerellidae	
	Tricorythidae	
Limpet	Ancylidae	
Megaloptera	Corydalidae	4
	Sialidae	
Dragonfly	Aeshnidae	2
	Cordulegastridae	
	Corduliidae	
	Gomphidae	
	Libellulidae	
	Macromiidae	
	Petaluridae	
Damselfly	Calopterygidae	
	Coenagrionidae	2
	Lestidae	
	Protoneuridae	
Sowbug	Asellidae	
Diptera	Chironomidae	
	Simuliidae	9
	Tipulidae	
Beetles	Chrysomelidae	
	Curculionidae	
	Dytiscidae	
	Gyrinidae	
	Haliplidae	
	Helodidae	
	Hydrophilidae	
	Noteridae	
	Ptilodactylidae	
Hemiptera	Belostomatidae	
	Corixidae	
	Gelastocoridae	
	Gerridae	
	Hebridae	
	Hydrometridae	
	Mesoveliidae	
	Naucoridae	
	Nepidae	
	Notonectidae	
	Veliidae	
Lepidoptera	Pyralidae	
TOTAL		**99**

TOLERANT		
Diptera	Canaceidae	
	Ceratopogonidae	
	Chaoboridae	
	Cguribinudae	
	Culicidae	
	Dixidae	
	Dolichopodidae	
	Empididae	
	Ephydridae	
	Muscidae	
	Psychodidae	
	Ptychopteridae	
	Sciomyzidae	
	Stratiomyidae	
	Syrphidae	
	Tabanidae	
	Tanyderidae	
Oligochaetes	Enchytraeidae	
	Haplotaxidae	
	Lumbriculidae	
	Naididae	
	Tubificidae	
Non-operc. Snail	Lymnaeidae	
	Physidae	
	Planorbidae	
Flatworms	Dendrocoelidae	
	Planaridae	
Clams	Corbiculidae	
	Sphaeriidae	
Leeches	Erpobdellidae	
	Glossiphoniidae	
	Hirudinidae	
	Piscicolidae	
TOTAL		**0**

BIOLOGICAL MONITORING REPORT

Stream: Peak Creek Basin: New River Date: September 26, 2007 Location: Vicinity of Nanochemonics Station 4

SENSITIVE

Stonefly	Capniidae	
	Chloroperlidae	
	Leuctridae	
	Nemouridae	
	Peltoperlidae	
	Perlidae	
	Perlodidae	
	Pteronarcyidae	
Beetles	Dryopidae	
	Elmidae	
	Psephenidae	9
Mayfly	Baetiscidae	
	Ephemeridae	
	Heptageniidae	
	Leptophlebiidae	
	Isonychiidae	2
	Potamanthidae	
	Siphlonuridae	
Caddisfly	Brachycentridae	1
	Calamoceratidae	
	Glossosomatidae	
	Helicopsychidae	
	Hydroptilidae	
	Lepidostomatidae	
	Leptoceridae	
	Limnephilidae	
	Molannidae	
	Odontoceridae	
	Phryganeidae	
	Philopotamidae	5
	Psychomyiidae	
	Rhyacophilidae	
Sponge	Spongillidae	
Neuroptera	Sisyridae	
Operc. Snail	Pleuroceridae	
	Viviparidae	
Oligochaetes	Branchiobdellidae	
Mussels	Unionidae	
Crayfish	Cambaridae	
Watermite	Diplodontidae	
	Hydrachnidae	
	Libertiidae	
	Sperchonidae	
Diptera	Blephariceridae	
	Athericidae	
TOTAL		**17**

FACULTATIVE

Shrimp	Palaemonidae	
Scuds	Gammaridae	
	Talitridae	
Caddisfly	Hydropsychidae	276
	Polycentropodidae	
Mayfly	Baetidae	
	Caenidae	
	Ephermerellidae	
	Tricorythidae	
Limpet	Ancylidae	
Megaloptera	Corydalidae	2
	Sialidae	
Dragonfly	Aeshnidae	
	Cordulegastridae	
	Corduliidae	
	Gomphidae	
	Libellulidae	
	Macromiidae	
	Petaluridae	
Damselfly	Calopterygidae	
	Coenagrionidae	1
	Lestidae	
	Protoneuridae	
Sowbug	Asellidae	
Diptera	Chironomidae	5
	Simuliidae	6
	Tipulidae	
Beetles	Chrysomelidae	
	Curculionidae	
	Dytiscidae	
	Gyrinidae	
	Haliplidae	
	Helodidae	
	Hydrophilidae	
	Noteridae	
	Ptilodactylidae	
Hemiptera	Belostomatidae	
	Corixidae	
	Gelastocoridae	
	Gerridae	
	Hebridae	
	Hydrometridae	
	Mesoveliidae	
	Naucoridae	
	Nepidae	
	Notonectidae	
	Veliidae	
Lepidoptera	Pyralidae	
TOTAL		**290**

TOLERANT

Diptera	Canaceidae	
	Ceratopogonidae	
	Chaoboridae	
	Cguribinudae	
	Culicidae	
	Dixidae	
	Dolichopohidae	
	Empididae	
	Ephydridae	
	Muscidae	
	Psychodidae	
	Ptychopteridae	
	Sciomyzidae	
	Stratiomyidae	
	Syrphidae	
	Tabanidae	
	Tanyderidae	
Oligochaetes	Enchytraeidae	
	Haplotaxidae	
	Lumbriculidae	
	Naididae	
	Tubificidae	
Non-operc. Snail	Lymnaeidae	
	Physidae	
	Planorbidae	
Flatworms	Dendrocoelidae	
	Planaridae	
Clams	Corbiculidae	
	Sphaeriidae	1
Leeches	Erpobdellidae	
	Glossiphoniidae	
	Hirudinidae	
	Piscicolidae	
TOTAL		**1**

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BIOLOGICAL MONITORING REPORT

Stream: Peak Creek Basin: New River Date: September 26, 2007 Location: Vicinity of Nanochemonics Station 5

SENSITIVE

Stonefly	Capniidae	
	Chloroperlidae	
	Leuctridae	
	Nemouridae	
	Peltoperlidae	
	Perlidae	
	Perlodidae	
	Pteronarcyidae	
Beetles	Dryopidae	
	Elmidae	8
	Psephenidae	13
Mayfly	Baetiscidae	
	Ephemeridae	
	Heptageniidae	1
	Leptophlebiidae	
	Isonychiidae	
	Potamanthidae	
	Siphlonuridae	
Caddisfly	Brachycentridae	
	Calamoceratidae	
	Glossosomatidae	
	Helicopsychidae	
	Hydroptilidae	
	Lepidostomatidae	
	Leptoceridae	
	Limnephilidae	
	Molannidae	
	Odontoceridae	
	Phryganeidae	
	Philopotamidae	2
	Psychomyiidae	
	Rhyacophilidae	
Sponge	Spongillidae	
Neuroptera	Sisyridae	
Operc. Snail	Pleuroceridae	
	Viviparidae	
Oligochaetes	Branchiobdellidae	
Mussels	Unionidae	
Crayfish	Cambaridae	
Watermite	Diplodontidae	
	Hydrachnidae	
	Libertiidae	
	Sperchonidae	
Diptera	Blephariceridae	
	Athericidae	
TOTAL		**24**

FACULTATIVE

Shrimp	Palaemonidae	
Scuds	Gammaridae	
	Talitridae	
Caddisfly	Hydropsychidae	122
	Polycentropodidae	
Mayfly	Baetidae	
	Caenidae	
	Ephemerellidae	
	Tricorythidae	
Limpet	Ancylidae	
Megaloptera	Corydalidae	1
	Sialidae	
Dragonfly	Aeshnidae	2
	Cordulegastridae	
	Corduliidae	
	Gomphidae	2
	Libellulidae	
	Macromiidae	
	Petaluridae	
Damselfly	Calopterygidae	
	Coenagrionidae	
	Lestidae	
	Protoneuridae	
Sowbug	Asellidae	
Diptera	Chironomidae	4
	Simuliidae	
	Tipulidae	
Beetles	Chrysomelidae	
	Curculionidae	
	Dytiscidae	
	Gyrinidae	
	Haliplidae	
	Helodidae	
	Hydrophilidae	
	Noteridae	
	Ptilodactylidae	
Hemiptera	Belostomatidae	
	Corixidae	
	Gelastocoridae	
	Gerridae	
	Hebridae	
	Hydrometridae	
	Mesoveliidae	
	Naucoridae	
	Nepidae	
	Notonectidae	
	Veliidae	
Lepidoptera	Pyralidae	
TOTAL		**131**

TOLERANT

Diptera	Canaceidae	
	Ceratopogonidae	
	Chaoboridae	
	Cguribinudae	
	Culicidae	
	Dixidae	
	Dolichopodidae	
	Empididae	
	Ephydridae	
	Muscidae	
	Psychodidae	
	Ptychopteridae	
	Sciomyzidae	
	Stratiomyidae	
	Syrphidae	
	Tabanidae	
	Tanyderidae	
Oligochaetes	Enchytraeidae	
	Haplotaxidae	
	Lumbriculidae	
	Naididae	
	Tubificidae	
Non-operc. Snail	Lymnaeidae	
	Physidae	
	Planorbidae	
Flatworms	Dendrocoelidae	
	Planaridae	
Clams	Corbiculidae	
	Sphaeriidae	
Leeches	Erpobdellidae	
	Glossiphoniidae	
	Hirudinidae	
	Piscicolidae	
TOTAL		**0**

BIOLOGICAL MONITORING REPORT

Stream: Peak Creek   Basin: New River   Date: September 26, 2007   Location: Vicinity of Nanochemonics Station 3

SENSITIVE

Stonefly	Capniidae	
	Chloroperlidae	
	Leuctridae	
	Nemouridae	
	Peltoperlidae	
	Perlidae	
	Perlodidae	
	Pteronarcyidae	
Beetles	Dryopidae	
	Elmidae	
	Psephenidae	2
Mayfly	Baetiscidae	
	Ephemeridae	
	Heptageniidae	10
	Leptophlebiidae	
	Isonychiidae	5
	Potamanthidae	
	Siphlonuridae	
Caddisfly	Brachycentridae	
	Calamoceratidae	
	Glossosomatidae	
	Helicopsychidae	
	Hydroptilidae	
	Lepidostomatidae	
	Leptoceridae	
	Limnephilidae	
	Molannidae	
	Odontoceridae	
	Phryganeidae	
	Philopotamidae	
	Psychomyiidae	
	Rhyacophilidae	
Sponge	Spongillidae	
Neuroptera	Sisyridae	
Operc. Snail	Pleuroceridae	1
	Viviparidae	
Oligochaetes	Branchiobdellidae	
Mussels	Uniondidae	
Crayfish	Cambaridae	
Watermite	Diplodontidae	
	Hydrachnidae	
	Libertiidae	
	Sperchonidae	
Diptera	Blephariceridae	
	Athericidae	
TOTAL		18

FACULTATIVE

Shrimp	Palaemonidae	
Scuds	Gammaridae	
	Talitridae	
Caddisfly	Hydropsychidae	166
	Polycentropodidae	
Mayfly	Baetidae	
	Caenidae	
	Ephemerellidae	
	Tricorythidae	
Limpet	Ancylidae	
Megaloptera	Corydalidae	1
	Sialidae	
	Aeshnidae	
	Cordulegastridae	
	Corduliidae	
	Gomphidae	2
	Libellulidae	
	Macromiidae	
	Petaluridae	
Damselfly	Calopterygidae	
	Coenagrionidae	2
	Lestidae	
	Protoneuridae	
Sowbug	Asellidae	
Diptera	Chironomidae	13
	Simuliidae	7
	Tipulidae	1
Beetles	Chrysomelidae	
	Curculionidae	
	Dytiscidae	
	Gyrinidae	
	Haliplidae	
	Helodidae	
	Hydrophilidae	
	Noteridae	
	Ptilodactylidae	
Hemiptera	Belostomatidae	
	Corixidae	
	Gelastocoridae	
	Gerridae	
	Hebridae	
	Hydrometridae	
	Mesoveliidae	
	Naucoridae	
	Nepidae	
	Notonectidae	
	Veliidae	
Lepidoptera	Pyralidae	
TOTAL		192

TOLERANT

Diptera	Canaceidae	
	Ceratopogonidae	
	Chaoboridae	
	Cguribinudae	
	Culicidae	
	Dixidae	
	Dolichopohidae	
	Empididae	
	Ephydridae	
	Muscidae	
	Psychodidae	
	Ptychopteridae	
	Sciomyzidae	
	Stratiomyidae	
	Syrphidae	
	Tabanidae	
	Tanyderidae	
Oligochaetes	Enchytraeidae	
	Haplotaxidae	
	Lumbriculidae	
	Naididae	
	Tubificidae	
Non-operc. Snail	Lymnaeidae	
	Physidae	
	Planorbidae	
Flatworms	Dendrocoelidae	
	Planaridae	
Clams	Corbiculidae	
	Sphaeriidae	3
Leeches	Erpobdellidae	
	Glossiphoniidae	
	Hirudianidae	
	Piscicolidae	
TOTAL		3

Attachment G

Wasteload and Limit Calculations

- **MIXER Program Output**
- **Wasteload Allocation Spreadsheet**
- **STATS Program Outputs (ammonia, copper, zinc)**

Mixing Zone Predictions for Nanochemonics Loadings, LLC

Effluent Flow = 0.93 MGD
Stream 7Q10 = 1.14 MGD
Stream 30Q10 = 1.14 MGD
Stream 1Q10 = 1.14 MGD
Stream slope = 0.002 ft/ft
Stream width = 61 ft
Bottom scale = 3
Channel scale = 1

Mixing Zone Predictions @ 7Q10

Depth = .2313 ft
Length = 11974.43 ft
Velocity = .2271 ft/sec
Residence Time = .6102 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = .2313 ft
Length = 11974.43 ft
Velocity = .2271 ft/sec
Residence Time = .6102 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .2313 ft
Length = 11974.43 ft
Velocity = .2271 ft/sec
Residence Time = 14.6459 hours

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 6.83% of the 1Q10 is used.

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Nanochemonics Holdings, LLC   Permit No.: VA0000281

Receiving Stream: Peak Creek   Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	25 mg/L
90% Temperature (Annual) =	20.4 deg C
90% Temperature (Wet season) =	20.4 deg C
90% Maximum pH =	8.6 SU
10% Maximum pH =	7.6 SU
Tier Designation (1 or 2) =	1
Public Water Supply (PWS) Y/N? =	n
Trout Present Y/N? =	n
Early Life Stages Present Y/N? =	y

Stream Flows

1Q10 (Annual) =	1.14 MGD
7Q10 (Annual) =	1.14 MGD
30Q10 (Annual) =	1.14 MGD
1Q10 (Wet season) =	1.14 MGD
30Q10 (Wet season)	1.14 MGD
30Q5 =	1.14 MGD
Harmonic Mean =	1.14 MGD
Annual Average =	MGD

Mixing Information

Annual - 1Q10 Mix =	6.83 %
- 7Q10 Mix =	100 %
- 30Q10 Mix =	100 %
Wet Season - 1Q10 Mix =	100 %
- 30Q10 Mix =	100 %

Effluent Information

Mean Hardness (as CaCO3) =	135 mg/L
90% Temp (Annual) =	28 deg C
90% Temp (Wet season) =	28 deg C
90% Maximum pH =	9.4 SU
10% Maximum pH =	6.12 SU
Discharge Flow =	0.93 MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Acenapthene	0	--	--	na	2.7E+03	--	--	na	6.0E+03	--	--	--	--	--	--	--	--	--	--	na	6.0E+03
Acrolein	0	--	--	na	7.8E+02	--	--	na	1.7E+03	--	--	--	--	--	--	--	--	--	--	na	1.7E+03
Acrylonitrile [C]	0	--	--	na	6.6E+00	--	--	na	1.5E+01	--	--	--	--	--	--	--	--	--	--	na	1.5E+01
Aldrin [C]	0	3.0E+00	--	na	1.4E-03	3.3E+00	--	na	3.1E-03	--	--	--	--	--	--	--	--	3.3E+00	--	na	3.1E-03
Ammonia-N (mg/l) (Yearly)	0	1.32E+00	3.59E-01	na	--	1.4E+00	8.0E-01	na	--	--	--	--	--	--	--	--	--	1.4E+00	8.0E-01	na	--
Ammonia-N (mg/l) (High Flow)	0	1.82E+00	3.59E-01	na	--	4.1E+00	8.0E-01	na	--	--	--	--	--	--	--	--	--	4.1E+00	8.0E-01	na	--
Anthracene	0	--	--	na	1.1E+05	--	--	na	2.4E+05	--	--	--	--	--	--	--	--	--	--	na	2.4E+05
Antimony	0	--	--	na	4.3E+03	--	--	na	9.6E+03	--	--	--	--	--	--	--	--	--	--	na	9.6E+03
Arsenic	0	3.4E+02	1.5E+02	na	--	3.7E+02	3.3E+02	na	--	--	--	--	--	--	--	--	--	3.7E+02	3.3E+02	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Benzene [C]	0	--	--	na	7.1E+02	--	--	na	1.6E+03	--	--	--	--	--	--	--	--	--	--	na	1.6E+03
Benzidine [C]	0	--	--	na	5.4E-03	--	--	na	1.2E-02	--	--	--	--	--	--	--	--	--	--	na	1.2E-02
Benzo (a) anthracene [C]	0	--	--	na	4.9E-01	--	--	na	1.1E+00	--	--	--	--	--	--	--	--	--	--	na	1.1E+00
Benzo (b) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	1.1E+00	--	--	--	--	--	--	--	--	--	--	na	1.1E+00
Benzo (k) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	1.1E+00	--	--	--	--	--	--	--	--	--	--	na	1.1E+00
Benzo (a) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	1.1E+00	--	--	--	--	--	--	--	--	--	--	na	1.1E+00
Bis2-Chloroethyl Ether	0	--	--	na	1.4E+01	--	--	na	3.1E+01	--	--	--	--	--	--	--	--	--	--	na	3.1E+01
Bis2-Chloroisopropyl Ether	0	--	--	na	1.7E+05	--	--	na	3.8E+05	--	--	--	--	--	--	--	--	--	--	na	3.8E+05
Bromoform [C]	0	--	--	na	3.6E+03	--	--	na	8.0E+03	--	--	--	--	--	--	--	--	--	--	na	8.0E+03
Butylbenzylphthalate	0	--	--	na	5.2E+03	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	--	--	na	1.2E+04
Cadmium	0	5.1E+00	9.0E-01	na	--	5.5E+00	2.0E+00	na	--	--	--	--	--	--	--	--	--	5.5E+00	2.0E+00	na	--
Carbon Tetrachloride [C]	0	--	--	na	4.4E+01	--	--	na	9.8E+01	--	--	--	--	--	--	--	--	--	--	na	9.8E+01
Chlordane [C]	0	2.4E+00	4.3E-03	na	2.2E-02	2.6E+00	9.6E-03	na	4.9E-02	--	--	--	--	--	--	--	--	2.6E+00	9.6E-03	na	4.9E-02
Chloride	0	8.6E+05	2.3E+05	na	--	9.3E+05	5.1E+05	na	--	--	--	--	--	--	--	--	--	9.3E+05	5.1E+05	na	--
TRC	0	1.9E+01	1.1E+01	na	--	2.1E+01	2.4E+01	na	--	--	--	--	--	--	--	--	--	2.1E+01	2.4E+01	na	--
Chlorobenzene	0	--	--	na	2.1E+04	--	--	na	4.7E+04	--	--	--	--	--	--	--	--	--	--	na	4.7E+04

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	3.4E+02	--	--	na	7.6E+02	--	--	--	--	--	--	--	--	--	--	na	7.6E+02
Chloroform [C]	0	--	--	na	2.9E+04	--	--	na	6.5E+04	--	--	--	--	--	--	--	--	--	--	na	6.5E+04
2-Chloronaphthalene	0	--	--	na	4.3E+03	--	--	na	9.6E+03	--	--	--	--	--	--	--	--	--	--	na	9.6E+03
2-Chlorophenol	0	--	--	na	4.0E+02	--	--	na	8.9E+02	--	--	--	--	--	--	--	--	--	--	na	8.9E+02
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	9.0E-02	9.1E-02	na	--	--	--	--	--	--	--	--	--	9.0E-02	9.1E-02	na	--
Chromium III	0	6.9E+02	5.8E+01	na	--	7.5E+02	1.3E+02	na	--	--	--	--	--	--	--	--	--	7.5E+02	1.3E+02	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.7E+01	2.4E+01	na	--	--	--	--	--	--	--	--	--	1.7E+01	2.4E+01	na	--
Chromium, Total	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Chrysene [C]	0	--	--	na	4.9E-01	--	--	na	1.1E+00	--	--	--	--	--	--	--	--	--	--	na	1.1E+00
Copper	0	1.7E+01	7.0E+00	na	--	1.8E+01	1.5E+01	na	--	--	--	--	--	--	--	--	--	1.8E+01	1.5E+01	na	--
Cyanide	0	2.2E+01	5.2E+00	na	2.2E+05	2.4E+01	1.2E+01	na	4.8E+05	--	--	--	--	--	--	--	--	2.4E+01	1.2E+01	na	4.8E+05
DDD [C]	0	--	--	na	8.4E-03	--	--	na	1.9E-02	--	--	--	--	--	--	--	--	--	--	na	1.9E-02
DDE [C]	0	--	--	na	5.9E-03	--	--	na	1.3E-02	--	--	--	--	--	--	--	--	--	--	na	1.3E-02
DDT [C]	0	1.1E+00	1.0E-03	na	5.9E-03	1.2E+00	2.2E-03	na	1.3E-02	--	--	--	--	--	--	--	--	1.2E+00	2.2E-03	na	1.3E-02
Demeton	0	--	1.0E-01	na	--	--	2.2E-01	na	--	--	--	--	--	--	--	--	--	--	2.2E-01	na	--
Dibenz(a,h)anthracene [C]	0	--	--	na	4.9E-01	--	--	na	1.1E+00	--	--	--	--	--	--	--	--	--	--	na	1.1E+00
Dibutyl phthalate	0	--	--	na	1.2E+04	--	--	na	2.7E+04	--	--	--	--	--	--	--	--	--	--	na	2.7E+04
Dichloromethane (Methylene Chloride) [C]	0	--	--	na	1.6E+04	--	--	na	3.6E+04	--	--	--	--	--	--	--	--	--	--	na	3.6E+04
1,2-Dichlorobenzene	0	--	--	na	1.7E+04	--	--	na	3.8E+04	--	--	--	--	--	--	--	--	--	--	na	3.8E+04
1,3-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	5.8E+03	--	--	--	--	--	--	--	--	--	--	na	5.8E+03
1,4-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	5.8E+03	--	--	--	--	--	--	--	--	--	--	na	5.8E+03
3,3-Dichlorobenzidine[C]	0	--	--	na	7.7E-01	--	--	na	1.7E+00	--	--	--	--	--	--	--	--	--	--	na	1.7E+00
Dichlorobromomethane [C]	0	--	--	na	4.6E+02	--	--	na	1.0E+03	--	--	--	--	--	--	--	--	--	--	na	1.0E+03
1,2-Dichloroethane [C]	0	--	--	na	9.9E+02	--	--	na	2.2E+03	--	--	--	--	--	--	--	--	--	--	na	2.2E+03
1,1-Dichloroethylene	0	--	--	na	1.7E+04	--	--	na	3.8E+04	--	--	--	--	--	--	--	--	--	--	na	3.8E+04
1,2-trans-dichloroethylene	0	--	--	na	1.4E+05	--	--	na	3.1E+05	--	--	--	--	--	--	--	--	--	--	na	3.1E+05
2,4-Dichlorophenol	0	--	--	na	7.9E+02	--	--	na	1.8E+03	--	--	--	--	--	--	--	--	--	--	na	1.8E+03
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,2-Dichloropropane[C]	0	--	--	na	3.9E+02	--	--	na	8.7E+02	--	--	--	--	--	--	--	--	--	--	na	8.7E+02
1,3-Dichloropropene	0	--	--	na	1.7E+03	--	--	na	3.8E+03	--	--	--	--	--	--	--	--	--	--	na	3.8E+03
Dieldrin [C]	0	2.4E-01	5.6E-02	na	1.4E-03	2.6E-01	1.2E-01	na	3.1E-03	--	--	--	--	--	--	--	--	2.6E-01	1.2E-01	na	3.1E-03
Diethyl Phthalate	0	--	--	na	1.2E+05	--	--	na	2.7E+05	--	--	--	--	--	--	--	--	--	--	na	2.7E+05
Di-2-Ethylhexyl Phthalate [C]	0	--	--	na	5.9E+01	--	--	na	1.3E+02	--	--	--	--	--	--	--	--	--	--	na	1.3E+02
2,4-Dimethylphenol	0	--	--	na	2.3E+03	--	--	na	5.1E+03	--	--	--	--	--	--	--	--	--	--	na	5.1E+03
Dimethyl Phthalate	0	--	--	na	2.9E+06	--	--	na	6.5E+06	--	--	--	--	--	--	--	--	--	--	na	6.5E+06
Di-n-Butyl Phthalate	0	--	--	na	1.2E+04	--	--	na	2.7E+04	--	--	--	--	--	--	--	--	--	--	na	2.7E+04
2,4 Dinitrophenol	0	--	--	na	1.4E+04	--	--	na	3.1E+04	--	--	--	--	--	--	--	--	--	--	na	3.1E+04
2-Methyl-4,6-Dinitrophenol	0	--	--	na	7.65E+02	--	--	na	1.7E+03	--	--	--	--	--	--	--	--	--	--	na	1.7E+03
2,4-Dinitrotoluene [C]	0	--	--	na	9.1E+01	--	--	na	2.0E+02	--	--	--	--	--	--	--	--	--	--	na	2.0E+02
Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) (ppq)	0	--	--	na	1.2E-06	--	--	na	na	--	--	--	--	--	--	--	--	--	--	na	na
1,2-Diphenylhydrazine[C]	0	--	--	na	5.4E+00	--	--	na	1.2E+01	--	--	--	--	--	--	--	--	--	--	na	1.2E+01
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.4E-01	1.2E-01	na	5.3E+02	--	--	--	--	--	--	--	--	2.4E-01	1.2E-01	na	5.3E+02
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.4E-01	1.2E-01	na	5.3E+02	--	--	--	--	--	--	--	--	2.4E-01	1.2E-01	na	5.3E+02
Endosulfan Sulfate	0	--	--	na	2.4E+02	--	--	na	5.3E+02	--	--	--	--	--	--	--	--	--	--	na	5.3E+02
Endrin	0	8.6E-02	3.6E-02	na	8.1E-01	9.3E-02	8.0E-02	na	1.8E+00	--	--	--	--	--	--	--	--	9.3E-02	8.0E-02	na	1.8E+00
Endrin Aldehyde	0	--	--	na	8.1E-01	--	--	na	1.8E+00	--	--	--	--	--	--	--	--	--	--	na	1.8E+00

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.9E+04	--	--	na	6.5E+04	--	--	--	--	--	--	--	--	--	--	na	6.5E+04
Fluoranthene	0	--	--	na	3.7E+02	--	--	na	8.2E+02	--	--	--	--	--	--	--	--	--	--	na	8.2E+02
Fluorene	0	--	--	na	1.4E+04	--	--	na	3.1E+04	--	--	--	--	--	--	--	--	--	--	na	3.1E+04
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	2.2E-02	na	--	--	--	--	--	--	--	--	--	--	2.2E-02	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	2.1E-03	5.6E-01	8.5E-03	na	4.7E-03	--	--	--	--	--	--	--	--	5.6E-01	8.5E-03	na	4.7E-03
Heptachlor Epoxide [C]	0	5.2E-01	3.8E-03	na	1.1E-03	5.6E-01	8.5E-03	na	2.4E-03	--	--	--	--	--	--	--	--	5.6E-01	8.5E-03	na	2.4E-03
Hexachlorobenzene [C]	0	--	--	na	7.7E-03	--	--	na	1.7E-02	--	--	--	--	--	--	--	--	--	--	na	1.7E-02
Hexachlorobutadiene [C]	0	--	--	na	5.0E+02	--	--	na	1.1E+03	--	--	--	--	--	--	--	--	--	--	na	1.1E+03
Hexachlorocyclohexane Alpha-BHC [C]	0	--	--	na	1.3E-01	--	--	na	2.9E-01	--	--	--	--	--	--	--	--	--	--	na	2.9E-01
Hexachlorocyclohexane Beta-BHC [C]	0	--	--	na	4.6E-01	--	--	na	1.0E+00	--	--	--	--	--	--	--	--	--	--	na	1.0E+00
Hexachlorocyclohexane Gamma-BHC [C] (Lindane)	0	9.5E-01	na	na	6.3E-01	1.0E+00	--	na	1.4E+00	--	--	--	--	--	--	--	--	1.0E+00	--	na	1.4E+00
Hexachlorocyclopentadiene	0	--	--	na	1.7E+04	--	--	na	3.8E+04	--	--	--	--	--	--	--	--	--	--	na	3.8E+04
Hexachloroethane [C]	0	--	--	na	8.9E+01	--	--	na	2.0E+02	--	--	--	--	--	--	--	--	--	--	na	2.0E+02
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	4.5E+00	na	--	--	--	--	--	--	--	--	--	--	4.5E+00	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	1.1E+00	--	--	--	--	--	--	--	--	--	--	na	1.1E+00
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Isophorone [C]	0	--	--	na	2.6E+04	--	--	na	5.8E+04	--	--	--	--	--	--	--	--	--	--	na	5.8E+04
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Lead	0	1.6E+02	9.3E+00	na	--	1.7E+02	2.1E+01	na	--	--	--	--	--	--	--	--	--	1.7E+02	2.1E+01	na	--
Malathion	0	--	1.0E-01	na	--	--	2.2E-01	na	--	--	--	--	--	--	--	--	--	--	2.2E-01	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	na	5.1E-02	1.5E+00	1.7E+00	na	1.1E-01	--	--	--	--	--	--	--	--	1.5E+00	1.7E+00	na	1.1E-01
Methyl Bromide	0	--	--	na	4.0E+03	--	--	na	8.9E+03	--	--	--	--	--	--	--	--	--	--	na	8.9E+03
Methoxychlor	0	--	3.0E-02	na	--	--	6.7E-02	na	--	--	--	--	--	--	--	--	--	--	6.7E-02	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Monochlorobenzene	0	--	--	na	2.1E+04	--	--	na	4.7E+04	--	--	--	--	--	--	--	--	--	--	na	4.7E+04
Nickel	0	2.2E+02	1.6E+01	na	4.6E+03	2.4E+02	3.5E+01	na	1.0E+04	--	--	--	--	--	--	--	--	2.4E+02	3.5E+01	na	1.0E+04
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Nitrobenzene	0	--	--	na	1.9E+03	--	--	na	4.2E+03	--	--	--	--	--	--	--	--	--	--	na	4.2E+03
N-Nitrosodimethylamine [C]	0	--	--	na	8.1E+01	--	--	na	1.8E+02	--	--	--	--	--	--	--	--	--	--	na	1.8E+02
N-Nitrosodiphenylamine [C]	0	--	--	na	1.6E+02	--	--	na	3.6E+02	--	--	--	--	--	--	--	--	--	--	na	3.6E+02
N-Nitrosodi-n-propylamine [C]	0	--	--	na	1.4E+01	--	--	na	3.1E+01	--	--	--	--	--	--	--	--	--	--	na	3.1E+01
Parathion	0	6.5E-02	1.3E-02	na	--	7.0E-02	2.9E-02	na	--	--	--	--	--	--	--	--	--	7.0E-02	2.9E-02	na	--
PCB-1016	0	--	1.4E-02	na	--	--	3.1E-02	na	--	--	--	--	--	--	--	--	--	--	3.1E-02	na	--
PCB-1221	0	--	1.4E-02	na	--	--	3.1E-02	na	--	--	--	--	--	--	--	--	--	--	3.1E-02	na	--
PCB-1232	0	--	1.4E-02	na	--	--	3.1E-02	na	--	--	--	--	--	--	--	--	--	--	3.1E-02	na	--
PCB-1242	0	--	1.4E-02	na	--	--	3.1E-02	na	--	--	--	--	--	--	--	--	--	--	3.1E-02	na	--
PCB-1248	0	--	1.4E-02	na	--	--	3.1E-02	na	--	--	--	--	--	--	--	--	--	--	3.1E-02	na	--
PCB-1254	0	--	1.4E-02	na	--	--	3.1E-02	na	--	--	--	--	--	--	--	--	--	--	3.1E-02	na	--
PCB-1260	0	--	1.4E-02	na	--	--	3.1E-02	na	--	--	--	--	--	--	--	--	--	--	3.1E-02	na	--
PCB Total [C]	0	--	--	na	1.7E-03	--	--	na	3.8E-03	--	--	--	--	--	--	--	--	--	--	na	3.8E-03

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Pentachlorophenol [C]	0	3.7E+00	3.9E+00	na	8.2E+01	4.0E+00	8.6E+00	na	1.8E+02	--	--	--	--	--	--	--	--	**4.0E+00**	**8.6E+00**	**na**	**1.8E+02**
Phenol	0	--	--	na	4.6E+06	--	--	na	1.0E+07	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.0E+07**
Pyrene	0	--	--	na	1.1E+04	--	--	na	2.4E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+04**
Radionuclides (pCi/l except Beta/Photon)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Gross Alpha Activity	0	--	--	na	1.5E+01	--	--	na	3.3E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.3E+01**
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	8.9E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.9E+00**
Strontium-90	0	--	--	na	8.0E+00	--	--	na	1.8E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E+01**
Tritium	0	--	--	na	2.0E+04	--	--	na	4.5E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.5E+04**
Selenium	0	2.0E+01	5.0E+00	na	1.1E+04	2.2E+01	1.1E+01	na	2.4E+04	--	--	--	--	--	--	--	--	**2.2E+01**	**1.1E+01**	**na**	**2.4E+04**
Silver	0	5.2E+00	--	na	--	5.6E+00	--	na	--	--	--	--	--	--	--	--	--	**5.6E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane [C]	0	--	--	na	1.1E+02	--	--	na	2.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+02**
Tetrachloroethylene [C]	0	--	--	na	8.9E+01	--	--	na	2.0E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+02**
Thallium	0	--	--	na	6.3E+00	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+01**
Toluene	0	--	--	na	2.0E+05	--	--	na	4.5E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.5E+05**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	7.5E-03	7.9E-01	4.5E-04	na	1.7E-02	--	--	--	--	--	--	--	--	**7.9E-01**	**4.5E-04**	**na**	**1.7E-02**
Tributyltin	0	4.6E-01	6.3E-02	na	--	5.0E-01	1.4E-01	na	--	--	--	--	--	--	--	--	--	**5.0E-01**	**1.4E-01**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	9.4E+02	--	--	na	2.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.1E+03**
1,1,2-Trichloroethane [C]	0	--	--	na	4.2E+02	--	--	na	9.3E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.3E+02**
Trichloroethylene [C]	0	--	--	na	8.1E+02	--	--	na	1.8E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E+03**
2,4,6-Trichlorophenol [C]	0	--	--	na	6.5E+01	--	--	na	1.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+02**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Vinyl Chloride [C]	0	--	--	na	6.1E+01	--	--	na	1.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+02**
Zinc	0	1.4E+02	9.2E+01	na	6.9E+04	1.5E+02	2.0E+02	na	1.5E+05	--	--	--	--	--	--	--	--	**1.5E+02**	**2.0E+02**	**na**	**1.5E+05**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens,
   Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Mixing ratios may be substituted for stream flows where appropriate.

Metal	Target Value (SSTV)
Antimony	9.6E+03
Arsenic	1.5E+02
Barium	na
Cadmium	1.2E+00
Chromium III	7.8E+01
Chromium VI	6.9E+00
Copper	7.3E+00
Iron	na
Lead	1.2E+01
Manganese	na
Mercury	1.1E-01
Nickel	2.1E+01
Selenium	6.7E+00
Silver	2.2E+00
Zinc	6.2E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

0.930 MGD DISCHARGE FLOW - STREAM MIX PER "Mix.exe"

Discharge Flow Used for WQS-WLA Calculations (MGI 0.930

	Stream Flows Allocated to Mix (MGD)		Total Mix Flows Stream + Discharge (MGD)	
	Dry Season	Wet Season	Dry Season	Wet Season
1Q10	0.078	1.140	1.008	2.070
7Q10	1.140	N/A	2.070	N/A
30Q10	1.140	1.140	2.070	2.070
30Q5	1.140	N/A	2.070	N/A
Harm. Mean	1.140	N/A	2.070	N/A
Annual Avg.	0.000	N/A	0.930	N/A

Stream/Discharge Mix Values

	Dry Season	Wet Season
1Q10 90th% Temp. Mix (deg C)	27.413	23.814
30Q10 90th% Temp. Mix (deg C)	23.814	23.814
1Q10 90th% pH Mix (SU)	9.000	8.806
30Q10 90th% pH Mix (SU)	8.806	8.806
1Q10 10th% pH Mix (SU)	6.154	N/A
7Q10 10th% pH Mix (SU)	6.450	N/A

	Calculated	Formula Inputs
1Q10 Hardness (mg/L as CaCO3)	126.5	126.5
7Q10 Hardness (mg/L as CaCO3)	74.4	74.4

Ammonia - Dry Season - Acute

90th Percentile pH (SU)	9.000
(7.204 - pH)	-1.796
(pH - 7.204)	1.796
Trout Present Criterion (mg N/l	0.885
Trout Absent Criterion (mg N/L	1.324
Trout Present?	n
Effective Criterion (mg N/L)	1.324

Ammonia - Dry Season - Chronic

90th Percentile Temp. (deg C)	23.814
90th Percentile pH (SU)	8.806
MIN	1.565
MAX	23.814
(7.688 - pH)	-1.118
(pH - 7.688)	1.118
Early LS Present Criterion (mg N	0.359
Early LS Absent Criterion (mg N/	0.359
Early Life Stages Present?	y
Effective Criterion (mg N/L)	0.359

Ammonia - Wet Season - Acute

90th Percentile pH (SU)	8.806
(7.204 - pH)	-1.602
(pH - 7.204)	1.602
Trout Present Criterion (mg N/l	1.219
Trout Absent Criterion (mg N/L	1.825
Trout Present?	n
Effective Criterion (mg N/L)	1.825

Ammonia - Wet Season - Chronic

90th Percentile Temp. (deg C)	23.814
90th Percentile pH (SU)	8.806
MIN	1.565
MAX	23.814
(7.688 - pH)	-1.118
(pH - 7.688)	1.118
Early LS Present Criterion (mg N	0.359
Early LS Absent Criterion (mg N/	0.359
Early Life Stages Present?	y
Effective Criterion (mg N/L)	0.359

0.930 MGD DISCHARGE FLOW - COMPLETE STREAM MIX

Discharge Flow Used for WQS-WLA Calculations (MGI 0.930

	100% Stream Flows Allocated to Mix (MGD)		Total Mix Flows Stream + Discharge (MGD)	
	Dry Season	Wet Season	Dry Season	Wet Season
1Q10	1.140	1.140	2.070	2.070
7Q10	1.140	N/A	2.070	N/A
30Q10	1.140	1.140	2.070	2.070
30Q5	1.140	N/A	2.070	N/A
Harm. Mean	1.140	N/A	2.070	N/A
Annual Avg.	0.000	N/A	0.930	N/A

Stream/Discharge Mix Values

	Dry Season	Wet Season
1Q10 90th% Temp. Mix (deg C)	23.814	23.814
30Q10 90th% Temp. Mix (deg C)	23.814	23.814
1Q10 90th% pH Mix (SU)	8.806	8.806
30Q10 90th% pH Mix (SU)	8.806	8.806
1Q10 10th% pH Mix (SU)	6.450	N/A
7Q10 10th% pH Mix (SU)	6.450	N/A

	Calculated	Formula Inputs
1Q10 Hardness (mg/L as CaCO3) =	74.420	74.420
7Q10 Hardness (mg/L as CaCO3) =	74.420	74.420

Ammonia - Dry Season - Acute

90th Percentile pH (SU)	8.806
(7.204 - pH)	-1.602
(pH - 7.204)	1.602
Trout Present Criterion (mg N/l	1.219
Trout Absent Criterion (mg N/L	1.825
Trout Present?	n
Effective Criterion (mg N/L)	1.825

Ammonia - Dry Season - Chronic

90th Percentile Temp. (deg C)	23.814
90th Percentile pH (SU)	8.806
MIN	1.565
MAX	23.814
(7.688 - pH)	-1.118
(pH - 7.688)	1.118
Early LS Present Criterion (mg N	0.359
Early LS Absent Criterion (mg N/	0.359
Early Life Stages Present?	y
Effective Criterion (mg N/L)	0.359

Ammonia - Wet Season - Acute

90th Percentile pH (SU)	8.806
(7.204 - pH)	-1.602
(pH - 7.204)	1.602
Trout Present Criterion (mg N/l	1.219
Trout Absent Criterion (mg N/L	1.825
Trout Present?	n
Effective Criterion (mg N/L)	1.825

Ammonia - Wet Season - Chronic

90th Percentile Temp. (deg C)	23.814
90th Percentile pH (SU)	8.806
MIN	1.565
MAX	23.814
(7.688 - pH)	-1.118
(pH - 7.688)	1.118
Early LS Present Criterion (mg N	0.359
Early LS Absent Criterion (mg N/	0.359
Early Life Stages Present?	y
Effective Criterion (mg N/L)	0.359

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Facility = Nanochemonics Holdings, LLC
Chemical = ammonia as nitrogen (mg/L)
Chronic averaging period = 30
WLAa = 1.4
WLAc = 0.8
Q.L. = 0.10
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 5
Expected Value = .185970
Variance = .012450
C.V. = 0.6
97th percentile daily values = .452545
97th percentile 4 day average = .309416
97th percentile 30 day average= .224290
< Q.L. = 1
Model used = BPJ Assumptions, Type 1 data

No Limit is required for this material

The data are:

0.85
0.33
0
0.12
0.62

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Facility = Nanochemonics Holdings, LLC
Chemical = dissolved copper (ug/L)
Chronic averaging period = 4
WLAa = 18
WLAc = 15
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 1000
Variance = 360000
C.V. = 0.6
97th percentile daily values = 2433.41
97th percentile 4 day average = 1663.79
97th percentile 30 day average= 1206.05
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 18
Average Weekly limit = 18
Average Monthly LImit = 18

The data are:

1000

4/8/2008 4:31:19 PM

Facility = Nanochemonics Holdings, LLC
Chemical = dissolved zinc (ug/L)
Chronic averaging period = 4
WLAa = 150
WLAc = 200
Q.L. = 0.2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 1000
Variance = 360000
C.V. = 0.6
97th percentile daily values = 2433.41
97th percentile 4 day average = 1663.79
97th percentile 30 day average= 1206.05
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 150
Average Weekly limit = 150
Average Monthly LImit = 150

The data are:

1000

Attachment H

Whole Effluent Toxicity Test Data

- 1994 WET Limit Determination
- WET Limit Compliance Review Memorandum
- Acute/Chronic Toxicity Endpoint Spreadsheet (WETLIM10)
- Permittee Toxicity Evaluations

1994 159

M E M O R A N D U M

DEPARTMENT OF ENVIRONMENTAL QUALITY
Water Regional Office

P.O. Box 7017 Roanoke, VA 24019

SUBJECT: Reissuance of Magnox, Incorporated
VPDES VA0000281

TO: File

FROM: Marcia Degen, WCRO Marcia J. Degen

DATE: January 25, 1994

COPIES: Permit Fact Sheet

A TMP for Magnox was developed by D. DeBiasi on March 1, 1993, for incorporation into a permit modification that was never processed. That TMP required completion of the TRE and set a WET limit. The special conditions listed in the March 1, 1993, memo were updated to reflect current language as described in the TMP guidance document 93-029 and in the Update to Appendix E dated January 19, 1994. No changes were made to the type of testing required (3-brood survival and reproduction tests using *Ceriodaphnia dubia*).

MINIMUM STREAM FLOW IS TO BE MAINTAINED AT 1.5 MGD. LIMIT WAS RECALCULATED USING THIS IWC AND THIS NEW LIMIT OF 2.73 TU_c IS IN THE PERMIT.

7Q10 = 1.5

WET LIMIT CALCULATION - Fill in IWC and ACR.

IWC =	45%		
ACR =	2.97	(See below)	
	0.72		
	0.57		
	2.4		
DIL =	2.24 TUc		
WLAc =	0.67 TUa		
WLAa,c =	1.99 TUc		
LTAc =	1.61		
LTAa,c =	1.14		
MDL =	3.87 TUc	NOEC =	25.87 Use most stringent
MDL =	2.73 TUc	NOEC =	36.67 of these two values
	0.202020 TUa		
*******	0.27 TUa when only acute data available		366.73 = LC50

The calculated limit is more representative if it can be calculated with a site-specific ACR. This should be done by making direct comparison between acute and chronic data for the same species with tests run on the same dates. (ie, if there was an acute test run during or just before a chronic test, divide the LC50 by the NOEC for that species for those tests and get an ACR. Or, the LC50 value can be calculated from the survival of the organisms during the first 48 hours of a chronic test.) If there is more than one data pair, calculate individual ACR's and and take the geometric mean.

An LC50 reported as >100% is not useful in this calculation because the resulting ACR is not a specific number. We only know that the ACR is higher than some number. Therefore, do not use a data pair if the LC50 is reported as >100%. If all LC50's are >100% then the effluent is not acutely toxic and we only need to calculate a WLAc in order to set a WET limit. Some statistics programs will calculate an LC50 that is higher than 100. If you can get a real

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
West Central Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Whole Effluent Toxicity (WET) Limit Compliance Review
Nanochemonics Holdings, LLC; VPDES Permit No. VA0000281

TO: File

FROM: Becky L. France, Environmental Engineer Senior

DATE: April 8, 2008 (Revised September 2, 2008)

COPIES: Deborah DeBiasi, TSO

CURRENT WET TESTING REQUIREMENTS:

Outfall 001 has a Whole Effluent Toxicity (WET) limit of 2.73 TU_c with chronic toxicity testing of outfall 001 using Ceriodaphnia dubia from 24-hour flow weighted composite samples. This WET limit became effective on March 1, 1997. A memorandum describing the calculation of this limit is attached.

The facility has completed fifteen quarters of chronic tests using Ceriodaphnia dubia. The permitee failed to meet the WET limit for the December 2007 test. Additionally, the calculated LC_{50} at 48 hours was 83.7 percent for the September 2007 test. The permittee passed the March and June 2008 toxicity tests with a TU_c of 1.0. Table 2 contains a summary of the quarterly toxicity testing data. Table 3 contains chemical characterization of effluent included with each test to support any relationships between effluent constituents and potential toxicity.

TOXICITY TESTING HISTORY:

In 1997, the facility identified sodium sulfate as the primary cause of toxicity problems. This toxicity was noted when the sodium sulfate concentration reached 2,000 mg/L. The facility began separating high sulfate process water from the clarifiers and filter presses and routing to Peppers Ferry Regional Wastewater Treatment Authority. This high sulfate process water was routed to a tank associated with the process for pH adjustment to precipitate nickel and zinc to within pretreatment specifications. All high sulfate process water was routed to a day tank (40,000 gallons) and discharged to the Peppers Ferry WWTP at an average flow rate of 75 gpm. Following completion of these changes, the effluent discharged from Pond No. 1 averaged sulfate well below a level of 2,000 mg/L which was sufficient to cause toxicity in excess of the WET limit.

Upon completion of the project to route high sulfate wastewater to the Peppers Ferry WWTP, toxicity problems became evident again. Therefore, Nanochemonics entered into a Special Order by Consent to begin an accelerated Toxicity Reduction Evaluation (TRE) Program. The results of the toxicity evaluation revealed that cobalt contributed to the toxicity problems. When the HIEN Process was in operation, cobalt was solubilized into the effluent. Cobalt was found to be toxic at levels above 40 μg/L and inhibited reproduction at levels greater than 5.1 μg/L. The results of the testing indicated that the effluent toxicity exceeded the WET limit when the cobalt concentration exceeded approximately 20 μg/L. Further toxicity testing revealed that an optimal maximum cobalt concentration was between 5-6 μg/L. The 1999 TRE indicated that lime addition via precipitation effectively reduced toxicity. Therefore, the addition of caustic soda for pH adjustment was discontinued, and the facility began using lime exclusively for the precipitation process.

Toxicity testing results in November 1999 indicated chronic toxicity above the WET limit. This toxicity may have been due to impurities in the ferrous sulfate (copperas). Therefore, the supplier of copperas was required to provide material only from the original source.

In February 2000, chronic toxicity was noted as well as an increase in dissolved cobalt and a reduction in effluent hardness. To improve the effectiveness of the toxic metal ion removal, a process modification was completed to provide a continuous dosing of lime to raise the hardness above 95 mg/L. The modification changes are described in the report "Effluent Hardness Evaluation on Chronic Toxicity" dated April 3, 2000 found in the attached pages.

In November 2000, toxicity test failed the whole effluent toxicity limit even thought the effluent hardness was higher than 95 mg/L. Nanochemonics concluded that the November 2000 chronic effluent toxicity was influenced by fine solids carryover in the treatment process. Waste caustic recycling was implemented to allow for increased hardness from lime. Also, Nanochemonics cleaned Pond No. 4 which resulted in improved effluent clarity.

In September of 2007, Nanochemonics stopped routing high sulfate wastewater to the process sewer. The pretreatment permit with the Town of Pulaski expired on January 2008 and has not been renewed. Nanochemonics recycles caustic soda back into the process. In January 2008, the toxicity test results of 4.0 TU_c failed the limit of 2.73 TU_c. The permittee believed the lower total hardness and cobalt were significant contributors to the toxicity.

RECOMMENDATIONS: Maintain the WET limit of 2.73 TU_c from the previous permit. There appears to be a great deal of variability in the sulfate, conductivity, hardness, cobalt, and total dissolved solids. Additionally, there have been changes in the wastewater characteristics. Furthermore, insteam benthic testing indicates a continuing moderate impact downstream of the discharge. Five toxicity tests have been completed since the facility stopped routing high sulfate wastewater to the sanitary sewer. Five monthly toxicity tests using Ceriodaphnia dubia and Pimephales promelas are needed to evaluate whether the effluent is toxic to the aquatic organisms. These 10 toxicity tests will provide adequate data for statistical reevaluation of the limit. Following five monthly toxicity tests, quarterly chronic toxicity tests using the most sensitive may be initiated.

Table 1 **FACILITY INFORMATION**

FACILITY: Nanochemonics Holdings, LLC

LOCATION: 720 Commerce Street, Pulaski, Virginia

VPDES #: VA0000281 Expiration Date: January 15, 2012

SIC CODE/DESCRIPTION: 2816 Inorganic Pigments

OUTFALLS/FLOWS (MGD): **Outfall 001** = 0.93 MGD (maximum 30 day flow).

WASTEWATER AND TREATMENT:

The facility treats process water associated with the production of metallic oxides. Treatment consists of alkalization, flocculation, settling basins, and reacidification. Sludge from the settling basins is dewatered in the sludge drying bed.

RECEIVING STREAM/CRITICAL FLOWS/IWC/HARDNESS:

Receiving Stream:	Peak Creek	WET Limit = 2.73 TU_c
River Basin:	New River	
Section:	2	
Class:	IV	
Special Standards:	v, NEW-5	
NOEC = 37 %		

CURRENT TMP REQUIREMENTS:

Biological – Quarterly chronic toxicity testing using Ceriodaphnia dubia on 24-hour flow weighted composite samples.

TESTING LABORATORY:

Olver Laboratories Incorporated

TOXICITY TEST DATA

Table 2 Chronic Toxicity Test Results; Nanochemonics Holdings, LLC; VPDES Permit No. VA0000281, Outfall 001

Test Date (month/year) Quarter (Q)	Test Organism	TU_c	NOEC Survival %	NOEC Reproduction %	% Survival in 100% effluent
9/04 Q1	Ceriodaphnia dubia	1.0	100	100	100
11/04 Q2	Ceriodaphnia dubia	1.0	100	100	100
3/05 Q3	Ceriodaphnia dubia	2.0	100	50	100
6/05 Q4	Ceriodaphnia dubia	Invalid	Invalid	Invalid	Invalid
9/05** Q5	Ceriodaphnia dubia	Invalid	Invalid	Invalid	Invalid
10/05 Q5	Ceriodaphnia dubia	2.7	37	37	50
11/05 Q6	Ceriodaphnia dubia	2.7	100	37	90
4/06 Q7	Ceriodaphnia dubia	2.7	100	37	100
6/06 Q8	Ceriodaphnia dubia	1.0	100	100	90
10/06 Q9	Ceriodaphnia dubia	1.0	100	100	90
12/06 Q10	Ceriodaphnia dubia	1.0	100	100	80
3/07 Q11	Ceriodaphnia dubia	1.0	100	100	100
6/07 Q12	Ceriodaphnia dubia	1.0	100	100	70
9/07 Q13	Ceriodaphnia dubia	2.0	75	50	0
12/07 Q14	Ceriodaphnia dubia	**4.0**	100	25	80
3/07 Q15	Ceriodaphnia dubia	1.0	100	100	100
6/08 Q16	Ceriodaphnia dubia	1.0	100	100	100

**This test was terminated due to atypically poor performance in control group. Then the fifth quarter testing was rerun in October 2005.

Nanochemonics Holdings LLC
VA0000281

Date	dissolved cobalt (µg/L)		total dissolved solids (mg/L)		sodium (mg/L)		sulfate (mg/L)		conductivity		hardness (mg/L)			LC50	TUc	NOEC Survival	NOEC Repro	survival in 100%
	average	max	average	max	average	max	average	max	average	max	average	min	max					
Sep-04	<5	<5	6578	6578	<QL	<QL	2539	4308			138	110	160	>100	1.0	100	100	100
Nov-04	<5	<5	4842	4842	1523	1523	652	672	2280	2462	174	150	200	>100	1.0	100	100	100
Mar-05	<5	<5	2154	2154	580	580	3220	3220	1990	2225	150	140	170	>100	2.0	100	50	100
Oct-05	<5	<5	**7499**	**7499**	2413	2413	1144	1144	1841	2056	100	64	136	>100	**2.7**	37	37	50
Nov-05	<5	<5	3401	3401	1119	1119	**4693**	**4693**	2234	3002	159	116	208	>100	**2.7**	100	37	90
Apr-06	<5	<5	1164	1213	312	335	596	628	1656	1742	141	112	176	>100	**2.7**	100	37	100
Jun-06	<5	<5	1547	1771	449	530	949	1029	2174	2488	133	56	216	>100	1.0	100	100	90
Oct-06	<5	<5	87	154	190	284	465	623	1106	1561	124	68	196	>100	1.0	100	100	90
Dec-06	<5	<5	1265	1860	293	402	535	658	1677	1944	91	88	100	>100	1.0	100	100	80
Mar-07	<5	<5	1873	2512	557	750	1104	1499	2573	3452	**189**	**124**	**236**	>100	1.0	100	100	100
Jun-07	<5	<5	2359	2718	685	910	1398	1869	3468	3890	127	100	156	>100	1.0	100	100	70
Sep-07	**12**	**23**	1917	3153	<650	1070	1096	1728	**3246**	**4596**	143	136	152	83.7	**2.0**	75	50	**0**
Dec-07	<=10.8	**19**	1488	1890	406	525	406	525	2335	2823	109	64	160	>100	**4.0**	100	**25**	80
Mar-08	<QL	<QL	1056.8	1680	299.4	370	632.6	822	1782	2128	203	156	272	>100	1.0	100	100	100
Jun-08	<QL	<QL	1033	1220	313	370	605	787	1663	1975	127	124	136	>100	1.0	100	100	100

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1															
2		**Spreadsheet for determination of WET test endpoints or WET limits**													
3															
4		**Excel 97**			**Acute Endpoint/Permit Limit**			**Use as LC_{50} in Special Condition, as TUa on DMR**							
5		**Revision Date: 01/10/05**													
6		**File: WETLIM10.xls**			**ACUTE**	**100% =**	**NOAEC**	**LC_{50} =**	**NA**	% Use as	**NA**	**TUa**			
7		**(MIX.EXE required also)**													
8					**ACUTE WLAa**		**0.32511677**	Note: Inform the permittee that if the mean of the data exceeds							
9								this TUa:	**1.0**	a limit may result using WLA.EXE					
10															
11					**Chronic Endpoint/Permit Limit**			**Use as NOEC in Special Condition, as TUc on DMR**							
12															
13					**CHRONIC**	**3.251167822**	**TU_c**	**NOEC =**	**31**	% Use as	**3.22**	**TU_c**			
14					**BOTH***	**3.251167822**	**TU_c**	**NOEC =**	**31**	% Use as	**3.22**	**TU_c**			
15	**Enter data in the cells with blue type:**				**AML**	**3.251167822**	**TU_c**	**NOEC =**	**31**	% Use as	**3.22**	**TU_c**			
16															
17	Entry Date:		06/27/08		**ACUTE WLAa,c**		**3.25116774**		Note: Inform the permittee that if the mean						
18	Facility Name:		Nanochemonics		**CHRONIC WLAc**		**2.22580645**		of the data exceeds this TUc:			**1.33605009**			
19	VPDES Number:		**VA0000281**		* Both means acute expressed as chronic				a limit may result using WLA.EXE						
20	Outfall Number:		**001**												
21					**% Flow to be used from MIX.EXE**				**Difuser /modeling study?**						
22	Plant Flow:		**0.93**	MGD					Enter Y/N	**N**					
23	Acute 1Q10:		**1.14**	MGD	**6.83**	%			Acute		:1				
24	Chronic 7Q10:		**1.14**	MGD	**100**	%			Chronic		:1				
25															
26	Are data available to calculate CV? (Y/N)				N	(Minimum of 10 data points, same species, needed)					Go to Page 2				
27	Are data available to calculate ACR? (Y/N)				N	(NOEC<LC50, do not use greater/less than data)					Go to Page 3				
28															
29															
30	IWC_a		92.27453759	%	Plant flow/plant flow + 1Q10		**NOTE: If the IWCa is >33%, specify the**								
31	IWC_c		44.92753623	%	Plant flow/plant flow + 7Q10			**NOAEC = 100% test/endpoint for use**							
32															
33	Dilution, acute		1.083722581	100/IWCa											
34	Dilution, chronic		2.225806452	100/IWCc											
35															
36	WLA_a		0.325116774	Instream criterion (0.3 TUa) X's Dilution, acute											
37	WLA_c		2.225806452	Instream criterion (1.0 TUc) X's Dilution, chronic											
38	$WLA_{a,c}$		3.251167742	ACR X's WLA_a - converts acute WLA to chronic units											
39															
40	ACR -acute/chronic ratio		10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)											
41	CV-Coefficient of variatior		0.6	Default of 0.6 - if data are available, use tables Page 2)											
42	Constants	eA	0.4109447	Default = 0.41											
43		eB	0.6010373	Default = 0.60											
44		eC	2.4334175	Default = 2.43											
45		eD	2.4334175	Default = 2.43 (1 samp)		No. of sample	1	****The Maximum Daily Limit is calculated from the lowest**							
46								**LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.**							
47	$LTA_{a,c}$		1.336050152	WLAa,c X's eA											
48	LTA_c		1.3377927	WLAc X's eB							Rounded NOEC's		%		
49	MDL** with $LTA_{a,c}$		3.251167822	TU_c	NOEC =	30.758178	(Protects from acute/chronic toxicity)				NOEC =	31	%		
50	MDL** with LTA_c		3.255408168	TU_c	NOEC =	30.718114	(Protects from chronic toxicity)				NOEC =	31	%		
51	AML with lowest LTA		3.251167822	TU_c	NOEC =	30.758178	Lowest LTA X's eD				NOEC =	31			
52															
53	IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a														
54											Rounded LC50's		%		
55	MDL with $LTA_{a,c}$		0.325116782	TU_a	LC50 =	307.581784	%	Use NOAEC=100%			LC50 =	NA	%		
56	MDL with LTA_c		0.325540817	TU_a	LC50 =	307.181142	%	Use NOAEC=100%			LC50 =	NA			
57															
58															

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
59															
60		**Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)**													
61															
62		IF YOU HAVE AT LEAST 10 DATA POINTS THAT					Vertebrate			Invertebrate					
63		ARE QUANTIFIABLE (NOT "<" OR ">")					IC_{25} Data			IC_{25} Data					
64		FOR A SPECIES, ENTER THE DATA IN EITHER					or			or					
65		COLUMN "G" (VERTEBRATE) OR COLUMN					LC_{50} Data	LN of data		LC_{50} Data	LN of data				
66		"J" (INVERTEBRATE). THE 'CV' WILL BE					***********			************					
67		PICKED UP FOR THE CALCULATIONS				1	0		1	0					
68		BELOW. THE DEFAULT VALUES FOR eA,				2			2						
69		eB, AND eC WILL CHANGE IF THE 'CV' IS				3			3						
70		ANYTHING OTHER THAN 0.6.				4			4						
71						5			5						
72						6			6						
73						7			7						
74		Coefficient of Variation for effluent tests				8			8						
75						9			9						
76		CV =	0.6	(Default 0.6)		10			10						
77						11			11						
78		δ^2 =	0.3074847			12			12						
79		δ =	0.554513029			13			13						
80						14			14						
81		Using the log variance to develop eA				15			15						
82			(P. 100, step 2a of TSD)			16			16						
83		Z = 1.881 (97% probability stat from table				17			17						
84		A =	-0.88929666			18			18						
85		eA =	0.410944686			19			19						
86						20			20						
87		Using the log variance to develop eB													
88			(P. 100, step 2b of TSD)			St Dev	NEED DATA	NEED DATA	St Dev	NEED DAT/	NEED DATA				
89		δ_4^2 =	0.086177696			Mean	0	0	Mean	0	0				
90		δ_4 =	0.293560379			Variance	0	0.000000	Variance	0	0.000000				
91		B =	-0.50909823			CV	0		CV	0					
92		eB =	0.601037335												
93															
94		Using the log variance to develop eC													
95			(P. 100, step 4a of TSD)												
96															
97		δ^2 =	0.3074847												
98		δ =	0.554513029												
99		C =	0.889296658												
100		eC =	2.433417525												
101															
102		Using the log variance to develop eD													
103			(P. 100, step 4b of TSD)												
104		n =	1	This number will most likely stay as "1", for 1 sample/month.											
105		δ_n^2 =	0.3074847												
106		δ_n =	0.554513029												
107		D =	0.889296658												
108		eD =	2.433417525												
109															

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Table 1. Result:	Vertebrate ACR	0
Table 2. Result:	Invertebrate ACR	0
	Lowest ACR	Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	37	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	37	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	37	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	100	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	100	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	100	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	100	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	100	#N/A	#N/A	#N/A	#N/A	NO DATA
9	83.7	50	1.674	0.515216	#N/A	#N/A	NO DATA
10	#N/A	25	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Convert LC_{50}'s and NOEC's to Chronic TU's
for use in WLA.EXE

Table 3. **ACR used: 10**

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50, enter it here:

enter it here:	NO DATA	%LC_{50}
	NO DATA	TUa

DILUTION SERIES TO RECOMMEND

Table 4.

	Monitoring % Effluent	Monitoring TUc	Limit % Effluent	Limit TUc
Dilution series based on data mean	74.8	1.3360501		
Dilution series to use for limit			31	3.2258065
Dilution factor to recommend:	0.8651445		0.5567764	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	86.5	1.16	55.7	1.80
	74.8	1.34	31.0	3.23
	64.8	1.54	17.3	5.79
	56.02	1.79	9.6	10.41
Extra dilutions if needed	48.47	2.06	5.4	18.69
	41.93	2.38	3.0	33.57

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

MAGNOX

MAGNOX PULASKI INCORPORATED
P.O. DRAWER 431
PULASKI, VIRGINIA 24301 USA
TEL (540) 980-3500
FAX (540) 980-6873

6-6-00 orig

T. Rogers (ltr), Permits (w/attach)

April 5, 2000

RECEIVED
APR 06 2000
DEQ-WCRO

Ms. Tammy Rogers
Enforcement Specialist
Virginia Department of Environmental Quality
West Central Regional Office
3019 Peters Creek Road, NW
Roanoke, VA 24019

Re: Response to Warning Letter No. 00-01-WCRO-059, Magnox-Pulaski Incorporated, VPDES Permit No. VA0000281, Job Number 61341.200

Dear Ms. Rogers:

In November 1999, Magnox-Pulaski Incorporated conducted quarterly chronic toxicity testing in accordance with the requirements of our VPDES permit. This testing, performed using *Ceriodaphnia*, resulted in a non-continuous dose-response; test organism reproduction in the middle effluent concentrations was significantly reduced relative to the controls while reproduction in the lowest and highest test solutions (including 100% effluent) was not significantly reduced. In accordance with EPA guidelines, the no observed effect concentration (NOEC) for this test was determined to be 12.5% effluent, with a corresponding TUc of 8.0. This resulted in an exceedence of the whole effluent toxicity (WET) limit of 2.73 TUc contained in the permit, and the issuance of the above-referenced warning letter.

Since the determination of a permit exceedence, Magnox initiated a series of investigations to identify the cause of non-compliance and implement appropriate corrective measures. These are summarized as follows:

1. Effluent Chemical Characterization: In conjunction with the toxicity testing, Magnox collected samples for chemical characterization and to monitor levels of effluent constituent previously determined to contribute to toxicity. Each of the four samples used in the November toxicity testing was analyzed for conductivity, alkalinity, hardness, total sodium, sulfate, total recoverable cobalt, and dissolved cobalt. The

generally within the ranges observed in previous testing that complied with permit limits.

2. Process Wastewater and Production Investigation: All aspects of product manufacturing and wastewater generation were investigated to identify differences in production activities and wastewater streams during this test period relative to prior test periods when the effluent was not toxic. This included examinations of raw materials, product lines in effect at the time of testing and corresponding rates of production, as well as general observations of staff responsible for overseeing production.
This investigation determined that production during this period was typical and focused on the generation of magnetites. Production rates were within typical ranges and no new processes were initiated during this period. With the exception of an unusual foaming problem in a copperas purification reactor, all other operations appeared normal. Further investigations and analysis of the raw materials used in the production processes at Magnox were conducted in an attempt to determine the cause of the observed foaming. These investigations suggested the potential presence of an impurity in the copperas (ferrous sulfate) used as raw material in the production of iron oxides. The supplier of the copperas was contacted and it was determined that the copperas in question originated from a new source. The supplier was instructed to provide future supplies of copperas from the original supplier only as a means of minimizing the potential for the introduction of toxic constituents in the waste stream.

3. Wastewater Treatment Evaluation: In conjunction with the wastewater generation investigations, an evaluation of the wastewater treatment process was performed to identify any potential deficiencies that could cause or contribute to the observed apparent toxicity. The results of this investigation indicated that the treatment system was operating within normal parameters and there were no visible or chemical indicators of treatment problems. No new treatment additives or processes were in place during this period and wastewater flows were not unusually high or low.

In summary, the results of these investigations appeared to indicate that an impurity (or impurities) in the copperas was the likely cause or contributor to the apparent toxicity observed in the November test. As a result, the supplier of copperas was required to provide material only from the original source.

Upon completion of these investigations, Magnox performed a follow-up test to ensure that the corrective actions implemented were effective. This test, performed in December 1999 indicated a substantial reduction in toxicity relative to the November test. The test produced a typical dose response and the NOEC and corresponding TUc were 50% and 2.0, respectively. The TUc was within permit limits and the results of this test were provided with the December 1999 discharge monitoring report.

We believed that the corrective actions put in place will reduce the potential for

In February 2000, Magnox conducted the third quarter chronic toxicity testing. The sources of all raw materials were confirmed since the November test and the treatment system was operating within design criteria. In spite of this, the effluent used in testing proved to be toxic. Unlike the November test, the effluent exhibited a typical dose response and *Ceriodaphnia* reproduction was reduced in all test concentrations. The resulting NOEC and TUc values were <12.5% and >8.0, respectively. As in the past, Magnox and Olver Laboratories immediately initiated an investigation to determine the source of the observed toxicity. The results of this investigation indicated a substantial reduction in final effluent hardness and an increase in the concentrations of dissolved cobalt (Please see the attached table). Further investigation indicated that the wastewater generated during this period had a high pH and lime addition was not needed to adjust and maintain wastewater pH at the optimum metals flocculation and precipitation levels. As such, there appeared to be insufficient lime to effectively remove dissolved cobalt and increase hardness to non-toxic levels. After additional examination, it was determined that the only times this situation could be expected was during periods of high magnetite production when there are no low pH production process that neutralize the high pH magnetite wastewater.

In an effort to eliminate the potential for this occurrence in the future, Magnox immediately initiated a lime treatment investigation to determine the optimum lime feed rates and effluent hardness levels. Earlier work performed by Magnox and Olver Laboratories indicated effluent metals and toxicity were effectively controlled by lime treatment. The work in progress was performed to better control lime treatment to reflect variations in influent wastewater pH and flow. As described in detail in the attached report, Magnox initiated this program with a two week lime feed evaluation. The first week focused on determining the lime feed rates needed to maintain a final effluent hardness of 100 - 125 mg/L. This required the control of lime addition based on flow rather than pH as in the past. Once the feed rates were determined, effluent toxicity testing was repeated during the second week of the program to monitor the effects of increased lime feed and hardness on final effluent toxicity. The results of the toxicity testing were very positive; the NOEC and TUc values were 100% effluent and 1.0 TUc, respectively. The results of this test and the 3rd Quarter Toxicity Test are included herein. It will be noted on the March 2000 DMR that one copy of each toxicity test report were previously submitted on April 6,2000.

Magnox is committed to implementing a new lime feed system to ensure adequate lime addition to ensure compliance with the VPDES permit WET limit. We believe that these additional improvements will further enhance toxicity control and effluent quality. In addition, we plan to forward the results of additional investigations to your office for review as we progress through this project.

In light of recent test results, and in consideration of the program currently in place detail. At this time, we can discuss our schedule for implementation of new lime feed processes and associated compliance issues.

I hope that this information fully satisfies the requirement to respond to the warning letter and we look forward to the opportunity of meeting with you to discuss our addition plans and schedule of implementation. In the meantime, please do not hesitate to contact me or Lawrence Hoffman at Olver Laboratories Incorporated should you have any questions or require additional information.

Sincerely,

Carmine A DiNitto

Carmine DiNitto
President

CAD/egl

Enclosures

cc: Mr. R. Lawrence Hoffman, Vice President, Olver Laboratories Incorporated (w/encl.)
Ms. Becky L. France, Environmental Engineer, DEQ -Roanoke, Va.

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Magnox-Pulaski, Incorporated
Cumulative Quarterly Toxicity Data Summary
Ceriodaphnia dubia Chronic Toxicity Testing

T	TEST DATE	SAMPLE NO.	CONDUCTIVITY (μmhos/cm)	ALKALINITY (mg/L)	HARDNESS (mg/L)	TOTAL SODIUM (mg/L)	SULFATE (mg/L)	TOT. REC. COBALT (mg/L)	DISSOLVED COBALT (mg/L)	TOXICIT
y	1/11/99 - 1/18/99	1	2,490	256	80	513	905	0.025	0.008	NOEC = 37% TU_C = 2.7 IC_{25} >100%
		2	1,975	312	76	390	382	0.012	0.005	
		3	1,544	234	80	301	457	0.019	0.006	
		4	1,249	132	84	243	418	0.011	0.004	
		5	1,112	134	100	213	357	0.018	0.007	
ly	2/11/99 - 2/18/99	1	1,768	170	80	319	673	0.022	0.007	NOEC = 37% TU_C = 2.7 IC_{25} = 42.6%
		2	2,118	200	88	384	816	0.014	0.005	
		3	2,519	216	104	477	977	0.016	0.004	
		4	2,090	78	84	398	852	0.020	0.010	
		5	2,116	88	112	374	882	0.026	0.012	
ng	5/12/99 - 5/19/99	1	1,328	148	100	307	563	0.001	<0.001	NOEC = 100 TU_C = 1.0 IC_{25} >100%
		2	1,194	108	92	231	472	0.003	<0.001	
		3	1,035	116	96	202	428	<0.001	<0.001	
		4	929	108	108	182	393	<0.001	<0.001	
		5	1,008	116	100	149	365	<0.001	<0.001	
ing	8/09/99 - 8/16/99	1	1,810	40	124	360	660	0.006	0.001	NOEC = 100 TU_C = 1.0 IC_{25} >100%
		2	1,276	114	116	254	450	0.007	0.001	
		3	1,208	114	120	236	430	0.006	0.003	
		4	1,113	116	112	214	400	0.005	0.001	
		5	1,269	116	136	221	475	0.003	0.003	

Magnox-Pulaski, Incorporated
Cumulative Quarterly Toxicity Data Summary
***Ceriodaphnia dubia* Chronic Toxicity Testing**

NT	TEST DATE	SAMPLE NO.	CONDUCTIVITY (µmhos/cm)	ALKALINITY (mg/L)	HARDNESS (mg/L)	TOTAL SODIUM (mg/L)	SULFATE (mg/L)	TOT. REC. COBALT (mg/L)	DISSOLVED COBALT (mg/L)	TOXICI
ing	11/16/99 - 11/21/99	1	2,420	128	156	521	971	0.005	0.003	NOEC = 12.5 TU_C = 8.0 IC_{25} = 24.6% Noncontinuo
		2	1,788	138	136	355	600	0.009	0.005	
		3	1,458	116	108	285	527	0.009	0.004	
		4	1,460	178	112	289	198	0.005	0.003	
		Testing completed on Day 5 due to sufficient brood production in control group.								
ing	12/13/99 - 12/19/99	1	1,419	116	108	272	510	0.011	0.007	NOEC = 50% TU_C = 2.0 IC_{25} >100%
		2	1,280	114	108	226	459	0.009	0.005	
		3	1,083	120	96	205	399	0.007	0.001	
		4	1,158	124	120	207	418	0.004	0.002	
		5	1,153	94	120	214	432	0.003	0.001	
ing	2/21/00 - 2/27/00	1	2,068	162	68	471	726	0.012	0.010	NOEC = <12 TU_C = >8.0 IC_{25} <12.5%
		2	1,568	130	68	323	550	0.012	0.009	
		3	1,290	108	72	250	430	0.010	0.008	
		4	1,289	162	60	261	428	0.008	0.007	
		5	1,496	288	52	338	421	0.012	0.007	
ing	3/14/00 - 3/20/00	1	1,374	132	100	236	440	0.006	0.005	NOEC = 100 Tu_c = 1.0 IC_{25} >100%
		2	1,210	138	96	203	433	0.005	0.003	
		3	1,130	130	96	215	419	0.006	0.006	
		4	1,033	128	112	190	381	0.004	0.004	
		5	893	134	116	159	273	0.003	0.003	

nt starts quarterly sampling for new permit, effective date June 28, 1999.

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OLVE
LABORATOR

MAGNOX

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January 10, 2001

Ms. Becky France
Environmental Engineer Senior
West Central Regional Office
Department of Environmental Quality
3019 Peters Creek Road
Roanoke, VA 24019

Re: Whole Effluent Toxicity Issues, VPDES Permit No. VA0000281

Dear Becky:

In November 2000, Magnox-Pulaski Incorporated conducted quarterly chronic toxicity testing in accordance with the requirements of our VPDES permit. This testing, performed using *Ceriodaphnia*, resulted in a no observed effect concentration (NOEC) of < 12.5% effluent, with a corresponding TUc of > 8.0. This resulted in an exceedence of the whole effluent toxicity (WET) limit of 2.73 TUc contained in the permit. We were surprised to observe this level of effluent toxicity, especially after we had implemented modifications to our waste water treatment process and operations and maintenance (O&M) manual to ensure that effluent hardness remained at > 95 mg/L, a level determined previously to be appropriate to eliminate toxicity. Chronic toxicity testing performed March, May and August (after the modification in wastewater treatment process) resulted in NOEC values of 100% in each test and appeared to indicate that the process was effectively eliminating toxicity on a consistent basis.

Immediately upon completion of this test, Magnox and Olver Laboratories initiated additional investigations to identify the cause of non-compliance and implement appropriate corrective measures. These are summarized as follows:

1. <u>Effluent Chemical Characterization</u>: In conjunction with the toxicity testing, Magnox collected samples for chemical characterization and to monitor levels of effluent constituent previously determined to contribute to toxicity. Each of the four samples used in the November toxicity testing was analyzed for conductivity, alkalinity, hardness, total sodium, sulfate, total recoverable cobalt, and dissolved cobalt. The results of these analyses were compared to the results of historical analyses performed in conjunction with prior toxicity testing starting in January 1999.

in the hardness level from 65 to 110 $^{mg}/L$ as $CaCO_3$ was evident during the 3rd quarter follow-up toxicity test. This had a positive influence on (1) reduction of dissolved cobalt concentration, 8.2 to 4.2 $^{\mu g}/L$, and (2) increased NOEC Chronic Reproduction value to 100%.

Test Period	NOEC, %	TUc	$Hardness_{Avg}$	$Co_{,Dissolved\ Avg.}$
2nd QTR			$^{mg}/L$ as $CaCO_3$	µg/L
Survival	100	1.0	62	8.2
Reproduction	<12.5	>8.0	62	8.2
3rd QTR Follow-up				
Survival	100	1.0	110	4.2
Reproduction	100	1.0	110	4.2

As depicted in the attached table, the hardness of the effluent used in the November testing was within the range observed in the three most recent previous tests. Similarly, sodium, sulfate and conductivity were within ranges observed in previous nontoxic effluents although total recoverable and dissolved cobalt were slightly higher. Earlier testing indicated an optimal maximum of cobalt as 5-6 *u*g/L.

2. <u>Process Wastewater and Production Investigation</u>: All aspects of product manufacturing and wastewater generation were investigated to identify differences in production activities and wastewater streams during this test period relative to prior test periods when the effluent was not toxic. This included examinations of raw materials, product lines in effect at the time of testing and corresponding rates of production, as well as general observations of staff responsible for overseeing production.

   This investigation determined that production during this period was typical and focused on the generation of cobalt magnetite. Production rates were within typical ranges and no new processes were initiated during this period.

   In an effort to maximize resource utilization and minimize waste materials, Magnox developed a procedure for the recycling of waste caustic. This material was previously used in the wastewater treatment process but was redirected to the sanitary sewer in early 2000 once the need for lime treatment was determined to reduce effluent toxicity. The waste caustic is now used in production. For a short period during the recycling development process and immediately prior to the November 2000 testing, waste caustic was redirected to the wastewater treatment system. In light of previous investigations, lime treatment was continued during this period and minimum hardness levels were maintained as described in the O&M Manual. It was believed that this level of treatment would effectively mitigate any toxicity imparted due to the presence of waste caustic and any associated cobalt absorbed solids. Implementation of the recycling process (and termination of waste caustic discharge to the wastewater treatment system) was initiated approximately 8 days prior to the initiation of the November chronic test.

3. <u>Wastewater Treatment Evaluation</u>: In conjunction with the wastewater generation investigations, an evaluation of the wastewater treatment process was performed to identify any potential deficiencies that could cause or contribute to the observed apparent toxicity. The results of this investigation indicated that the treatment system was operating within normal parameters and there were no chemical indicators of treatment problems. Accumulated solids in Pond No. 4, the first pond in the treatment process, were higher than normal and some carryover of fine solids was observed during the sampling and testing period. The clarity of the effluent samples used in testing was less than that observed in the recent tests that produced NOEC = 100% results. Pond clean out was scheduled upon completion of toxicity testing. No new treatment additives or processes were in place during this period and wastewater flows were not unusually high or low.

redirection of waste caustic and any associated cobalt absorbed solids to the wastewater treatment system is a suspected source of the effluent cobalt. This is supported by the effluent cobalt concentrations which were higher than in the most recent tests and the fact that waste caustic was not introduced into the wastewater treatment system during the previous three tests that resulted in NOECs of 100%. Thus, it was suspected that lime addition rates used previously may not have been adequate for the cobalt concentrations observed in the November testing.

Upon completion of these investigations, Magnox cleaned Pond No. 4 and performed a follow-up test to ensure that this corrective action was effective. Waste caustic recycling was implemented previously and will continue into the future. The follow-up test, performed in December 2000 using 24-hour composite samples (collected manually at 4 hour intervals from a point directly upstream of the Outfall 001 weir) indicated a substantial reduction in toxicity relative to the November test. Effluent clarity was improved and the test produced an NOEC and corresponding TUc of 100% and 1.0, respectively. The TUc was within permit limits and the results of this test were provided with the December 2000 discharge monitoring report.

We believed that the corrective actions put in place will further reduce any potential for effluent toxicity. In light of recent test results, I remain available to meet with you and other regional office staff at your convenience to discuss these issues in more detail.

As always, please do not hesitate to contact me or Lawrence Hoffman at Olver Laboratories Incorporated should you have any questions or require additional information.

Sincerely,

Carmine DiNitto
President

CAD/egl

Enclosures

cc: Mr. R. Lawrence Hoffman, Vice President, Olver Laboratories Incorporated (w/encl.)
Ms. Tammy Rogers, Compliance Auditor, Department of Environmental Quality (w/encl.)
Mr. Robert Steele, Enforcement, Department of Environmental Quality (w/encl.)

Magnox-Pulaski, Incorporated
Cumulative Quarterly Toxicity Data Summary
Ceriodaphnia dubia Chronic Toxicity Testing (Page 1 of 3)

TEST DATE	SAMPLE NO.	CONDUCTIVITY (µmhos/cm)	ALKALINITY (mg/L)	HARDNESS (mg/L)	TOTAL SODIUM (mg/L)	SULFATE (mg/L)	TOT. REC. COBALT (mg/L)	DISSOLVED COBALT (mg/L)	TOXICITY
5/12/99 - 5/19/99	1	1,328	148	100	307	563	0.001	<0.001	NOEC = 100% TU_C = 1.0 IC_{25} >100%
	2	1,194	108	92	231	472	0.003	<0.001	
	3	1,035	116	96	202	428	<0.001	<0.001	
	4	929	108	108	182	393	<0.001	<0.001	
	5	1,008	116	100	149	365	<0.001	<0.001	
8/09/99 - 8/16/99	1	1,810	40	124	360	660	0.006	0.001	NOEC = 100% TU_C = 1.0 IC_{25} >100%
	2	1,276	114	116	254	450	0.007	0.001	
	3	1,208	114	120	236	430	0.006	0.003	
	4	1,113	116	112	214	400	0.005	0.001	
	5	1,269	116	136	221	475	0.003	0.003	
11/16/99 - 11/21/99	1	2,420	128	156	521	971	0.005	0.003	NOEC = 12.5% TU_C = 8.0 IC_{25} = 24.6% Noncontinuous
	2	1,788	138	136	355	600	0.009	0.005	
	3	1,458	116	108	285	527	0.009	0.004	
	4	1,460	178	112	289	198	0.005	0.003	
	Testing completed on Day 5 due to sufficient brood production in control group.								
12/13/99 - 12/19/99	1	1,419	116	108	272	510	0.011	0.007	NOEC = 50% TU_C = 2.0 IC_{25} >100%
	2	1,280	114	108	226	459	0.009	0.005	
	3	1,083	120	96	205	399	0.007	0.001	
	4	1,158	124	120	207	418	0.004	0.002	
	5	1,153	94	120	214	432	0.003	0.001	

starts quarterly sampling for new permit, effective date June 28, 1999.

Magnox-Pulaski, Incorporated
Cumulative Quarterly Toxicity Data Summary
Ceriodaphnia dubia Chronic Toxicity Testing (Page 2 of 3)

TEST DATE	SAMPLE NO.	CONDUCTIVITY (µmhos/cm)	ALKALINITY (mg/L)	HARDNESS (mg/L)	TOTAL SODIUM (mg/L)	SULFATE (mg/L)	TOT. REC. COBALT (mg/L)	DISSOLVED COBALT (mg/L)	TOXICITY
2/21/00 - 2/27/00	1	2,068	162	68	471	726	0.012	0.010	NOEC = <12.5% TU_C = >8.0 IC_{25} <12.5%
	2	1,568	130	68	323	550	0.012	0.009	
	3	1,290	108	72	250	430	0.010	0.008	
	4	1,289	162	60	261	428	0.008	0.007	
	5	1,496	288	52	338	421	0.012	0.007	
3/14/00 - 3/20/00	1	1,374	132	100	236	440	0.006	0.005	NOEC = 100% Tu_c = 1.0 IC_{25} >100%
	2	1,210	138	96	203	433	0.005	0.003	
	3	1,130	130	96	215	419	0.006	0.006	
	4	1,033	128	112	190	381	0.004	0.004	
	5	893	134	116	159	273	0.003	0.003	
5/22/00 - 5/28/00	1	2,247	202	204	461	803	<0.001	<0.001	NOEC = 100% Tu_c = 1.0 IC_{25} >100%
	2	2,094	226	180	443	738	<0.001	<0.001	
	3	1,744	238	164	365	593	<0.001	<0.001	
	4	1,470	78	108	298	483	0.001	<0.001	
	5	1,360	204	160	258	457	0.001	0.001	
8/14/00 - 8/20/00	1	1,501	220	244	232	540	<0.001	<0.001	NOEC = 100% Tu_c = 1.0 IC_{25} >100%
	2	1,530	230	240	231	538	<0.001	<0.001	
	3	1,506	248	280	220	521	<0.001	<0.001	
	4	1,410	280	320	252	351	<0.001	<0.001	
	5	1,556	242	308	247	521	<0.001	<0.001	

Magnox-Pulaski, Incorporated
Cumulative Quarterly Toxicity Data Summary
Ceriodaphnia dubia Chronic Toxicity Testing (Page 3 of 3)

-	TEST DATE	SAMPLE NO.	CONDUCTIVITY (µmhos/cm)	ALKALINITY (mg/L)	HARDNESS (mg/L)	TOTAL SODIUM (mg/L)	SULFATE (mg/L)	TOT. REC. COBALT (mg/L)	DISSOLVED COBALT (mg/L)	TOXICITY
g	11/13/00 - 11/19/00	1	2,003	172	112	360	812	0.010	0.007	NOEC < 12.5% Tu_c > 8.0 IC_{25} = 13.75%%
		2	1,878	176	116	352	738	0.010	0.006	
		3	1,954	162	112	361	762	0.009	0.005	
		4	2,898	194	148	583	1,310	0.008	0.004	
		Testing completed on Day 5 due to sufficient brood production in control group.								
g	12/15/00 - 12/22/00	1	2,808	188	152	598	1,290	tbd	tbd	NOEC = 100% Tu_c = 1.0 IC_{25} > 100%%
		2	2,176	202	168	451	861	tbd	tbd	
		3	2,145	192	156	451	755	tbd	tbd	
		4	2,155	194	160	431	678	tbd	tbd	
		Effluent Samples collected at Pond No. 1								

S: tbd = analyses in progress

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MAGNOX

INCORPORATED

MAGNOX PULASKI INCORPORATED
P.O. DRAWER 431
PULASKI, VIRGINIA 24301 USA
TEL (703) 980-3500
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TELEX 265138 MAGN-UR

April 3, 2000

RI-0001
Modified Lime Treatment –"Effluent Hardness Evaluation on Chronic Toxicity"
Work Period: 3/7/00-3/17/00
By: Keith Zarczynski- BSChE

RECEIVED

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DEQ-WCRO

SUMMARY

Objective

The purpose of this study was to determine if maintaining a hardness level at Outfall 001 of greater than 100 $^{mg}/L$ as $CaCO_3$ would positively influence the removal of selected metal ions while maintaining pH and passing a Third Quarter Follow-up Chronic toxicity test.

Results and Conclusions

Increased hardness levels, achieved maintaining a constant base lime flow (in assistance to the intermittent addition of lime from the waste treatment facility), can be associated with a decrease in the bioavailability of toxic metal ions to organisms. Improved removal of selected metals through lime assisted flocculation and precipitation, as well as an increase in the concentration of calcium ions, has proven to reduce the toxicity of specific metal ions which may be present in the effluent stream. Using historical effluent hardness and toxicity data, a hardness range of 100 to 125 $^{mg}/L$ as $CaCO_3$ was set as the target for minimization of available toxic metal ions, particularly cobalt. The hardness level range achieved over a testing period of one week was 97.5 to 126.5 $^{mg}/L$ as $CaCO_3$. Effluent hardness levels were measured at approximately two hour intervals by the Magnox staff over the entire testing period. Maximum flow of a 10 wt% solution of $Ca(OH)_2$ used was 0.80 gpm added to the existing waste treatment mixing pit. pH was monitored during the testing period and remained within the permit limits of 6 to 9 at Outfall 001. Toxicity testing (*Ceriodaphnia dubia* survival and reproduction test) conducted at Olver Laboratories during the sampling period resulted in an NOEC of 100% and TU_c of 1.0 for both survival and reproduction. Metal ions, due to an increase in hardness, specifically cobalt, were sufficiently reduced to non-toxic levels.

Introduction

The wastewater treatment facilities at Magnox, Inc. are operated in accordance with the DEQ-approved Waste Treatment Facility Operations and Maintenance Manual. This manual has been kept up to date as referred to in the March 2000 DEQ inspection report. In summary, the wastewater treatment processes include polymer addition to promote coagulation, lime addition to maintain optimum pH, solids removal by settling, and final pH adjustment using carbon dioxide. To date, lime slurry has been automatically controlled to adjust pH for optimum flocculation and precipitation according to the guidelines described in Section 4.2 of the Operations and Maintenance Manual.

Magnox continues to be environmentally aware of its effluent system activities, and continuously monitors effluent quality. However Magnox recently exceeded the VPDES permit wet limit during the second quarter toxicity test with a non-continuous dose response. Follow-up testing performed within one month of the second quarter test resulted in compliance with the effluent wet limit. Unexpectedly, the third quarterly toxicity test also exceeded the permit wet limit. A review of historical effluent test data showed that Magnox has typically shown compliance (with successful completion of the *Ceriodaphnia dubia* survival and reproduction test) when moderately hard effluent hardness levels were realized. Magnox, in keeping with its Environmental Policy, intends to take a proactive approach to remediate this non-compliance issue. It is known from historical testing, performed during the expired Consent Order TRE program, that treatment with lime is effective for the removal of metal ions, specifically cobalt.

Currently the Magnox lime treatment system is designed to maintain a pH in the waste treatment mixing pit of 10.8 to 11.5. Intermittent flow of lime from the pH control system results in fluctuations of hardness levels in the effluent stream. In an effort to better control effluent hardness, magnox initiated a two week testing program to establish lime feed rates necessary to maintain desired hardness levels and to determine the effects of increased hardness on effluent toxicity. The specific objectives of this program included:

(1) establishing lime addition rates by comparing actual vs. calculated effluent hardness values during the first week;

(2) improving the control of lime slurry addition to maintain a hardness level within the range of 100 to 125 mg/L as $CaCO_3$ during the second week testing period; and

(3) evaluating the effects of increased hardness and improved hardness control on effluent toxicity by conducting a chronic toxicity test during the second week.

This report summarizes the procedures and results of this testing.

Discussion of Results

Determination of the characteristic curve for the manual valve (¾" Apollo brass ball valve) operated for the addition of lime slurry flow to waste treatment mix pit was accomplished by timed weights of flow at predetermined valve settings (as % of full flow). The characteristic curve for the valve, as % of flow versus % valve opening based on 11.9 gpm of lime slurry as 100% flow, is shown in Figure 1. From Figure 1, timed mass trials are represented as single data points, and the curve represents an approximation of the equal-percentage characteristic of the ball valve. Due to the critical nature of minimization of error between the expected lime slurry flow rate (determined from the curve) and the actual flow rate, each lime slurry flow rate into the waste treatment mix pit was checked with a timed mass trial for determination of flow rate. Therefore the characteristic curve was used only as a guideline for determining the flow rate of lime slurry into the waste treatment mix pit.

With regards to an expected hardness level at the Outfall based on an input of Ca^{2+} ions at the waste treatment mix pit, an approximation of 50% of Ca^{2+} added was expected to be found as $CaCO_3$ in Outfall. This approximation was made to initially give a rough estimate of the amount of lime slurry flow needed to effect a response in hardness levels. Lime slurry flow rate, (lb lime slurry/sec), and effluent flow rate (gpm) were the variables used to estimate the expected amount of $CaCO_3$ at the Outfall. (Refer to Appendix A for sample calculations.)

The additional lime slurry flow rate (hereafter referred to as flow) into the waste treatment mix pit began on Tuesday, March 7th at 8 AM and continued, intermittently, until Friday, March 17th at 6 AM. Sampling of the Outfall, sample point 001, into Peak Creek was done from 8 AM Tuesday, March 7th to 10 AM Friday, March 17th in order to test for hardness levels, expressed as $^{mg}/L$ as $CaCO_3$. 0.5 L samples were taken once approximately every 2 hours, with some exceptions, and each sample was titrated to determine the hardness level. (Refer to Appendix B for hardness titration procedure.) Figure 2 depicts lime flow as gpm x 200 and also illustrates the hardness levels of the Outfall in relation to the anticipated hardness range (100 to 125 $^{mg}/L$ $CaCO_3$) targeted for the testing period.

An explicit function describing hardness level based on flow was not developed from the first week of lime addition testing for use during the second week. Rather, implicit flow strategies were developed based on the results of the first week and responses of hardness to flow changes during the second week. (An assumed six hour residence time for flow through the pond system was used for correlating additional lime flow to hardness level.)

From Figure 2, a sustained flow of 190 units (equivalent to 0.95 gpm) for a period of 10 hours from 8 AM to 6 PM on Thursday, March 9th resulted in an increase of approximately 100 $^{mg}/L$ as $CaCO_3$ (hereafter referred to as ppm) over a 28-hour period. Thus a flow of 0.95 gpm for 10 hours, followed by 18 hours of no flow, resulted in a hardness rate increase of 3.6 ppm/hr, over a 28-hour period. Without considering other dependent variables within the dynamics of the pond system and its effect on hardness, we can assume that at higher flow rates for sustained intervals of time, a cumulative effect on hardness can be expected. Therefore, flow rates within this high range (0.75 to 1.0 gpm) sustained for more than four hours will be considered detrimental to controlling hardness, within a given range at the Outfall. Continued observation of hardness rate change showed a slightly lower hardness rate decrease of roughly 3 ppm/hr, until flow dosing began at 6 AM Sunday, March 12th. Lowered dosing with flows averaging 80 units (equivalent to 0.4 gpm) with a range of 0 to 160 units (equivalent to 0.8 gpm) from 6 AM Sunday, March 12th to 6 AM Friday, March 17th over lowered sustained intervals of time (average of 2 to 4 hours of sustained flow, with a maximum of 10 hours sustained flow from 10 AM to 8 PM Tuesday, March 14th) were administered to effect a gradual increase in hardness levels, up to the desired range of 100 to 125 ppm, for the week of the testing period. Over the testing period, initially higher flow rates (50 to 160 units from Figure 2, equivalent to 0.25 to 0.8 gpm) were allowed to decline over time to compensate for the apparent cumulative effect that the flow exhibits on hardness levels at the Outfall. Therefore an implicit strategy for controlling hardness within the specified range was developed specific to the testing period.

Based on the theoretical and actual test data, a lime slurry flow of approximately 0.25 gpm was established as the minimum additional flow necessary to maintain a hardness level of >95 $^{mg}/L$ in Outfall 001,. Contribution of this additional lime is expected to give a hardness level increase of 35 $^{mg}/L$ as $CaCO_3$ to the effluent stream.

As observed on the pH recorder at the waste treatment pit, increased cycling fluctuations indicated a small influence of the additional lime slurry on the effectiveness of the pH control system of the mix pit, but the integrity of the control system was not violated based on the additional flow only. The effect of the additional lime slurry flow on control of pH from the waste treatment pit was observed for the additional flow period of 11 days. The additional lime flow can help to bring pH of effluent up to the optimum flocculent pH range in instances of low pH in the waste stream into the mix pit due to the time lag of the controller.

Conclusions and Recommendations

The effect of lime addition to increase hardness levels allows for an increase in the Ca^{2+} ion concentration and improves the overall removal of selected metals by assisting in flocculation and precipitation. It is proposed that Magnox add additional lime to the existing lime treatment system which will allow for a minimum hardness level of 95 $^{mg}/L$ as $CaCO_3$ at the Outfall and subsequent removal of toxic metal ions, particularly cobalt. A 10 wt% lime solution at an addition rate of approximately 0.25 gpm to the waste treatment mixing pit was determined to give a minimum target hardness level while maintaining Outfall 001 pH compliance. This lime slurry flow rate is recommended to keep a hardness level above 95 $^{mg}/L$ as $CaCO_3$ and to improve the effectiveness of toxic metal ions removal. A correlation between the average hardness levels from the 2nd and the 3rd quarter follow-up toxicity test can be made with average dissolved cobalt concentrations and NOEC values for the two test periods (see table below). An increase

Attachment I

NPDES Permit Rating Worksheet

NPDES PERMIT RATING WORK SHEET

VPDES NO. VA0000281

- ☐ Regular Addition
- ☐ DiscretionaryAddition
- ☐ Score change, but no status change
- ☐ Deletion

Facility Name: **Nanochemonics Holdings, LLC**

City: Pulaski, Virginia

Receiving Water: Peak Creek

Reach Number: ______

Is this facility a steam electric power plant (SIC=4911) with one or more of the following characteristics?

1. Power output 500 MW or greater (not using a cooling pond/lake)
2. A nuclear power plant
3. Cooling water discharge greater than 25% of the receiving stream's 7Q10 flow rate

☐ YES; score is 600 (stop here) ■ NO (continue)

Is this permit for a municipal separate storm sewer serving a population greater than 100,000?

☐ YES; score is 700 (stop here)
■ NO (continue)

FACTOR 1: Toxic Pollutant Potential

PCS SIC Code: ____ Primary SIC Code: 2816 Other SIC Codes: ______
Industrial Subcategory Code: 00 (Code 000 if no subcategory)

Determine the Toxicity potential from Appendix A. Be sure to use the TOTAL toxicity potential column and check one)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
☐ No process waste streams	0	0	☐ 3.	3	15	☐ 7.	7	35
☐ 1.	1	5	☐ 4.	4	20	☐ 8.	8	40
☐ 2.	2	10	☐ 5.	5	25	☐ 9.	9	45
			■ 6.	6	30	☐ 10.	10	50

Code Number Checked: 6

Total Points Factor 1: 30

FACTOR 2: Flow/Stream Flow Volume (*Complete either Section A or Section B; check only one*)

Section A ☐ Wastewater Flow Only Considered

Wastewater Type (See Instructions)		Code	Points
Type I: Flow < 5 MGD	☐	11	0
Flow 5 to 10 MGD	☐	12	10
Flow > 10 to 50 MGD	☐	13	20
Flow > 50 MGD	☐	14	30
Type II: Flow < 1 MGD	☐	21	10
Flow 1 to 5 MGD	☐	22	20
Flow > 5 to 10 MGD	☐	23	30
Flow > 10 MGD	☐	24	50
Type III: Flow < 1 MGD	☐	31	0
Flow 1 to 5 MGD	☐	32	10
Flow > 5 to 10 MGD	☐	33	20
Flow > 10 MGD	☐	34	30

Section B ☐ Wastewater and Stream Flow Considered

Wastewater Type (See Instructions)	Percent of instream Wastewater Concentration at Receiving Stream Low Flow		Code	Points
Type I/III:	< 10 %	☐	41	0
	10 % to < 50 %	☐	42	10
	> 50 %	☐	43	20
Type II:	< 10 %	☐	51	0
	10 % to <50 %	■	52	20
	> 50 %	☐	53	30

Code Checked from Section A or B: 52
Total Points Factor 2: 20

FACTOR 3: Conventional Pollutants
(only when limited by the permit)

VPDES NO: VA0000281

A. Oxygen Demanding Pollutant: (check one) ☐ BOD ☐ COD ☐ Other:______________

Permit Limits: (check one)			*Code*	*Points*
	☐	< 100 lbs/day	1	0
	☐	100 to 1000 lbs/day	2	5
	☐	> 1000 to 3000 lbs/day	3	15
	☐	> 3000 lbs/day	4	20

Code Checked: NA

Points Scored: 0

B. Total Suspended Solids (TSS)

Permit Limits: (check one)			*Code*	*Points*
	■	< 100 lbs/day	1	0
	☐	100 to 1000 lbs/day	2	5
	☐	> 1000 to 5000 lbs/day	3	15
	☐	> 5000 lbs/day	4	20

Code Checked: NA

Points Scored: 0

C. Nitrogen Pollutant: (check one) ☐ Ammonia ☐ Other:______________

Permit Limits: (check one)		*Nitrogen Equivalent*	*Code*	*Points*
	☐	< 300 lbs/day	1	0
	☐	300 to 1000 lbs/day	2	5
	☐	> 1000 to 3000 lbs/day	3	15
	☐	> 3000 lbs/day	4	20

Code Checked: NA

Points Scored: 0

Total Points Factor 3: 0

FACTOR 4: Public Health Impact

Is there a public drinking water supply located within 50 miles downstream of the effluent discharge (this includes any body of water to which the receiving water is a tributary)? A public drinking water supply may include infiltration galleries, or other methods of conveyance that ultimately get water from the above referenced supply.

■ YES (If yes, check toxicity potential number below)

☐ NO (If no, go to Factor 5)

Determine the *human health* toxicity potential from Appendix A. Use the same SIC code and subcategory reference as in Factor 1. (Be sure to use the human health toxicity group column ☐ check one below)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
☐ No process waste streams	0	0	☐ 3.	3	0	☐ 7.	7	15
☐ 1.	1	0	☐ 4.	4	0	☐ 8.	8	20
☐ 2.	2	0	☐ 5.	5	5	☐ 9.	9	25
			■ 6.	6	10	☐ 10.	10	30

Code Number Checked: 6

Total Points Factor 4: 10

FACTOR 5: Water Quality Factors VPDES NO. VA0000281

A. Is (or will) one or more of the effluent discharge limits based on water quality factors of the receiving stream (rather than technology-based federal effluent guidelines, or technology-based state effluent guidelines), or has a wasteload allocation been assigned to the discharge:

		Code	Points
■	Yes	1	10
☐	No	2	0

B. Is the receiving water in compliance with applicable water quality standards for pollutants that are water quality limited in the permit?

		Code	Points
☐	Yes	1	0
■	No	2	5

C. Does the effluent discharged from this facility exhibit the reasonable potential to violate water quality standards due to whole effluent toxicity?

		Code	Points
■	Yes	1	10
☐	No	2	0

Code Number Checked: A 1 B 2 C 1

Points Factor 5: A 10 + B 5 + C 10 = 25 TOTAL

FACTOR 6: Proximity to Near Coastal Waters

A. Base Score: Enter flow code here (from Factor 2): 52 *Enter the multiplication factor that corresponds to the flow code: 0.30*

Check appropriate facility HPRI Code (from PCS):

	HPRI#	*Code*	*HPRI Score*
☐	1	1	20
☐	2	2	0
☐	3	3	30
■	4	4	0
☐	5	5	20

Flow Code	*Multiplication Factor*
11, 31, or 41	0.00
12, 32, or 42	0.05
13, 33, or 43	0.10
14 or 34	0.15
21 or 51	0.10
22 or 52	0.30
23 or 53	0.60
24	1.00

HPRI code checked: ___

Base Score: (HPRI Score) 0 X (Multiplication Factor) 0.30 = 0 (TOTAL POINTS)

B. Additional Points ☐ NEP Program
For a facility that has an HPRI code of 3, does the facility discharge to one of the estuaries enrolled in the National Estuary Protection (NEP) program (see instructions) or the Chesapeake Bay?

		Code	Points
☐	Yes	1	10
■	No	2	0

C. Additional Points ☐ Great Lakes Area of Concern
For a facility that has an HPRI code of 5, does the facility discharge any of the pollutants of concern into one of the Great Lakes' 31 areas of concern (see Instructions)

		Code	Points
☐	Yes	1	10
■	No	2	0

Code Number Checked: A 4 B 2 C 2

Points Factor 6: A 0 + B 0 + C 0 = 0 TOTAL

SCORE SUMMARY

VPDES NO. VA0000281

Factor	Description	Total Points
1	Toxic Pollutant Potential	30
2	Flows/Streamflow Volume	20
3	Conventional Pollutants	0
4	Public Health Impacts	10
5	Water Quality Factors	25
6	Proximity to Near Coastal Waters	0
	TOTAL (Factors 1 through 6)	85

S1. Is the total score equal to or greater than 80? ☐ Yes (Facility is a major) ■ No

S2. If the answer to the above questions is no, would you like this facility to be a discretionary major?

■ No

☐ Yes (Add 500 points to the above score and provide reason below:

Reason:

NEW SCORE: _85_

OLD SCORE: _80_

Becky L. France
Permit Reviewer's Name

(540) 562-6700
Phone Number

3/11/08
Date

Attachment J

Public Notice

PUBLIC NOTICE – Environmental Permit

PURPOSE OF NOTICE: To seek public comment on a draft permit from the Department of Environmental Quality that will allow the release of treated wastewater and storm water into a water body in Pulaski County.
PUBLIC COMMENT PERIOD: 30 days following the public notice issue date; comment period ends 4:30 pm of last day
PERMIT NAME: Virginia Pollutant Discharge Elimination System Permit – Industrial Wastewater and Storm Water; issued by DEQ, under the authority of the State Water Control Board
APPLICANT NAME, ADDRESS AND PERMIT NUMBER : Nanochemonics Holdings, LLC, 1 Magnox Drive, Pulaski, VA 24301, VA0000281
FACILITY NAME AND LOCATION: Nanochemonics Holdings, LLC, 4 Magnox Drive, Pulaski, VA 24301
PROJECT DESCRIPTION: Nanochemonics Holdings, LLC has applied for a reissuance of a private permit for Nanochemonics in Pulaski County, Virginia. This permit will supercede the previous VPDES permit number VA0000281. The applicant proposes to release storm water and industrial process water at a rate of 0.93 MGD into a water body. The applicant proposes to release the treated industrial wastewater and storm water into Peak Creek in Pulaski in the Peak Creek watershed (VAW-L17R). A watershed is the land area drained by a river and its incoming streams. The permit will limit the following pollutants to amounts that protect water quality: solids, toxic pollutants, metals, temperature.
HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING: DEQ accepts comments and requests for public hearing by e-mail, fax, or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses ,and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requestor, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. DEQ may hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit.
CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS, AND ADDITIONAL INFORMATION:
NAME: Becky L. France; ADDRESS: Virginia Department of Environmental Quality, West Central Regional Office, 3019 Peters Creek Road, Roanoke, VA 24019-2738; PHONE: (540) 562-6700; E-MAIL ADDRESS: blfrance@deq.virginia.gov; FAX: (540) 562-6725. The public may review the drat permit and application above by appointment.

Attachment K

EPA Checksheet

Revised 2/2003

State "FY2003 Transmittal Checklist" to Assist in Targeting Municipal and Industrial Individual NPDES Draft Permits for Review

Part I. State Draft Permit Submission Checklist

In accordance with the MOA established between the Commonwealth of Virginia and the United States Environmental Protection Agency, Region III, the Commonwealth submits the following draft National Pollutant Discharge Elimination System (NPDES) permit for Agency review and concurrence.

Facility Name: Nanochemonics Holdings, LLC

NPDES Permit Number: VA0000281

Permit Writer Name: Becky L. France

Date: 3/17/08

Major [X] **Minor** [ ] **Industrial** [X] **Municipal** [ ]

I.A. Draft Permit Package Submittal Includes:	Yes	No	N/A
1. Permit Application?	X		
2. Complete Draft Permit (for renewal or first time permit – entire permit, including boilerplate information)?	X		
3. Copy of Public Notice?	X		
4. Complete Fact Sheet?	X		
5. A Priority Pollutant Screening to determine parameters of concern?	X		
6. A Reasonable Potential analysis showing calculated WQBELs?	X		
7. Dissolved Oxygen calculations?			X
8. Whole Effluent Toxicity Test summary and analysis?	X		
9. Permit Rating Sheet for new or modified industrial facilities?	X		

I.B. Permit/Facility Characteristics	Yes	No	N/A
1. Is this a new, or currently unpermitted facility?		X	
2. Are all permissible outfalls (including combined sewer overflow points, non-process water and storm water) from the facility properly identified and authorized in the permit?	X		
3. Does the fact sheet **or** permit contain a description of the wastewater treatment process?	X		

I.B. Permit/Facility Characteristics – cont. (FY2003)	Yes	No	N/A
4. Does the review of PCS/DMR data for at least the last 3 years indicate significant non-compliance with the existing permit?		X	
5. Has there been any change in streamflow characteristics since the last permit was developed?		X	
6. Does the permit allow the discharge of new or increased loadings of any pollutants?		X	
7. Does the fact sheet **or** permit provide a description of the receiving water body(s) to which the facility discharges, including information on low/critical flow conditions and designated/existing uses?	X		
8. Does the facility discharge to a 303(d) listed water?	X		
a. Has a TMDL been developed and approved by EPA for the impaired water?	X		
b. Does the record indicate that the TMDL development is on the State priority list and will most likely be developed within the life of the permit?			X
c. Does the facility discharge a pollutant of concern identified in the TMDL or 303(d) listed water?	X		
9. Have any limits been removed, or are any limits less stringent, than those in the current permit?		X	
10. Does the permit authorize discharges of storm water?	X		
11. Has the facility substantially enlarged or altered its operation or substantially increased its flow or production? Maximum 30 day average higher on application	X		
12. Are there any production-based, technology-based effluent limits in the permit?		X	
13. Do any water quality-based effluent limit calculations differ from the State's standard policies or procedures?		X	
14. Are any WQBELs based on an interpretation of narrative criteria?	X		
15. Does the permit incorporate any variances or other exceptions to the State's standards or regulations?		X	
16. Does the permit contain a compliance schedule for any limit or condition?		X	
17. Is there a potential impact to endangered/threatened species or their habitat by the facility's discharge(s)?		X	
18. Have impacts from the discharge(s) at downstream potable water supplies been evaluated?			X
19. Is there any indication that there is significant public interest in the permit action proposed for this facility?		X	
20. Have previous permit, application, and fact sheet been examined?	X		

Part II. NPDES Draft Permit Checklist (FY2003)

Region III NPDES Permit Quality Checklist – for POTWs
(To be completed and included in the record only for POTWs)

II.A. Permit Cover Page/Administration	Yes	No	N/A
1. Does the fact sheet or permit describe the physical location of the facility, including latitude and longitude (not necessarily on permit cover page)?			
2. Does the permit contain specific authorization-to-discharge information (from where to where, by whom)?			

II.B. Effluent Limits – General Elements	Yes	No	N/A
1. Does the fact sheet describe the basis of final limits in the permit (e.g., that a comparison of technology and water quality-based limits was performed, and the most stringent limit selected)?			
2. Does the fact sheet discuss whether "antibacksliding" provisions were met for any limits that are less stringent than those in the previous NPDES permit?			

II.C. Technology-Based Effluent Limits (POTWs)	Yes	No	N/A
1. Does the permit contain numeric limits for ALL of the following: BOD (or alternative, e.g., CBOD, COD, TOC), TSS, and pH?			
2. Does the permit require at least 85% removal for BOD (or BOD alternative) and TSS (or 65% for equivalent to secondary) consistent with 40 CFR Part 133?			
a. If no, does the record indicate that application of WQBELs, or some other means, results in more stringent requirements than 85% removal or that an exception consistent with 40 CFR 133.103 has been approved?			
3. Are technology-based permit limits expressed in the appropriate units of measure (e.g., concentration, mass, SU)?			
4. Are permit limits for BOD and TSS expressed in terms of both long term (e.g., average monthly) and short term (e.g., average weekly) limits?			
5. Are any concentration limitations in the permit less stringent than the secondary treatment requirements (30 mg/l BOD5 and TSS for a 30-day average and 45 mg/l BOD5 and TSS for a 7-day average)?			
a. If yes, does the record provide a justification (e.g., waste stabilization pond, trickling filter, etc.) for the alternate limitations?			

II.D. Water Quality-Based Effluent Limits	Yes	No	N/A
1. Does the permit include appropriate limitations consistent with 40 CFR 122.44(d) covering State narrative and numeric criteria for water quality?			
2. Does the fact sheet indicate that any WQBELs were derived from a completed and EPA approved TMDL?			

II.D. Water Quality-Based Effluent Limits – cont. (FY2003)	Yes	No	N/A
3. Does the fact sheet provide effluent characteristics for each outfall?			
4. Does the fact sheet document that a "reasonable potential" evaluation was performed?			
a. If yes, does the fact sheet indicate that the "reasonable potential" evaluation was performed in accordance with the State's approved procedures?			
b. Does the fact sheet describe the basis for allowing or disallowing in-stream dilution or a mixing zone?			
c. Does the fact sheet present WLA calculation procedures for all pollutants that were found to have "reasonable potential"?			
d. Does the fact sheet indicate that the "reasonable potential" and WLA calculations accounted for contributions from upstream sources (i.e., do calculations include ambient/background concentrations)?			
e. Does the permit contain numeric effluent limits for all pollutants for which "reasonable potential" was determined?			
5. Are all final WQBELs in the permit consistent with the justification and/or documentation provided in the fact sheet?			
6. For all final WQBELs, are BOTH long-term AND short-term effluent limits established?			
7. Are WQBELs expressed in the permit using appropriate units of measure (e.g., mass, concentration)?			
8. Does the record indicate that an "antidegradation" review was performed in accordance with the State's approved antidegradation policy?			

II.E. Monitoring and Reporting Requirements	Yes	No	N/A
1. Does the permit require at least annual monitoring for all limited parameters and other monitoring as required by State and Federal regulations?			
a. If no, does the fact sheet indicate that the facility applied for and was granted a monitoring waiver, AND, does the permit specifically incorporate this waiver?			
2. Does the permit identify the physical location where monitoring is to be performed for each outfall?			
3. Does the permit require at least annual influent monitoring for BOD (or BOD alternative) and TSS to assess compliance with applicable percent removal requirements?			
4. Does the permit require testing for Whole Effluent Toxicity?			

II.F. Special Conditions	Yes	No	N/A
1. Does the permit include appropriate biosolids use/disposal requirements?			
2. Does the permit include appropriate storm water program requirements?			

II.F. Special Conditions – cont. (FY2003)	Yes	No	N/A
3. If the permit contains compliance schedule(s), are they consistent with statutory and regulatory deadlines and requirements?			
4. Are other special conditions (e.g., ambient sampling, mixing studies, TIE/TRE, BMPs, special studies) consistent with CWA and NPDES regulations?			
5. Does the permit allow/authorize discharge of sanitary sewage from points other than the POTW outfall(s) or CSO outfalls [i.e., Sanitary Sewer Overflows (SSOs) or treatment plant bypasses]?			
6. Does the permit authorize discharges from Combined Sewer Overflows (CSOs)?			
a. Does the permit require implementation of the "Nine Minimum Controls"?			
b. Does the permit require development and implementation of a "Long Term Control Plan"?			
c. Does the permit require monitoring and reporting for CSO events?			
7. Does the permit include appropriate Pretreatment Program requirements?			

II.G. Standard Conditions	Yes	No	N/A
1. Does the **permit** contain all 40 CFR 122.41 standard conditions or the State equivalent (or more stringent) conditions?			

List of Standard Conditions – 40 CFR 122.41

Duty to comply	Property rights	Reporting Requirements
Duty to reapply	Duty to provide information	Planned change
Need to halt or reduce activity not a defense	Inspections and entry	Anticipated noncompliance
Duty to mitigate	Monitoring and records	Transfers
Proper O & M	Signatory requirement	Monitoring reports
Permit actions	Bypass	Compliance schedules
	Upset	24-Hour reporting
		Other non-compliance

	Yes	No	N/A
2. Does the permit contain the additional standard condition (or the State equivalent or more stringent conditions) for POTWs regarding notification of new introduction of pollutants and new industrial users [40 CFR 122.42(b)]?			

Part II. NPDES Draft Permit Checklist (FY2003)

Region III NPDES Permit Quality Review Checklist – For Non-Municipals
(To be completed and included in the record for all non-POTWs)

II.A. Permit Cover Page/Administration	Yes	No	N/A
1. Does the fact sheet **or** permit describe the physical location of the facility, including latitude and longitude (not necessarily on permit cover page)?	X		
2. Does the permit contain specific authorization-to-discharge information (from where to where, by whom)?	X		

II.B. Effluent Limits – General Elements	Yes	No	N/A
1. Does the fact sheet describe the basis of final limits in the permit (e.g., that a comparison of technology and water quality-based limits was performed, and the most stringent limit selected)?	X		
2. Does the fact sheet discuss whether "antibacksliding" provisions were met for any limits that are less stringent than those in the previous NPDES permit?	X		

II.C. Technology-Based Effluent Limits (Effluent Guidelines & BPJ)	Yes	No	N/A
1. Is the facility subject to a national effluent limitations guideline (ELG)?		X	
a. If yes, does the record adequately document the categorization process, including an evaluation of whether the facility is a new source or an existing source?			X
b. If no, does the record indicate that a technology-based analysis based on Best Professional Judgement (BPJ) was used for all pollutants of concern discharged at treatable concentrations?			X
2. For all limits developed based on BPJ, does the record indicate that the limits are consistent with the criteria established at 40 CFR 125.3(d)?			X
3. Does the fact sheet adequately document the calculations used to develop both ELG and /or BPJ technology-based effluent limits?			X
4. For all limits that are based on production or flow, does the record indicate that the calculations are based on a "reasonable measure of ACTUAL production" for the facility (not design)?			X
5. Does the permit contain "tiered" limits that reflect projected increases in production or flow?		X	
a. If yes, does the permit require the facility to notify the permitting authority when alternate levels of production or flow are attained?			X
6. Are technology-based permit limits expressed in appropriate units of measure (e.g., concentration, mass, SU)?	X		

II.C. Technology-Based Effluent Limits (Effluent Guidelines & BPJ) – cont.	Yes	No	N/A
7. Are all technology-based limits expressed in terms of both maximum daily, weekly average, and/or monthly average limits?	X		
8. Are any final limits less stringent than required by applicable effluent limitations guidelines or BPJ?		X	

II.D. Water Quality-Based Effluent Limits	Yes	No	N/A
1. Does the permit include appropriate limitations consistent with 40 CFR 122.44(d) covering State narrative and numeric criteria for water quality?	X		
2. Does the record indicate that any WQBELs were derived from a completed and EPA approved TMDL?	X		
3. Does the fact sheet provide effluent characteristics for each outfall?	X		
4. Does the fact sheet document that a "reasonable potential" evaluation was performed?	X		
a. If yes, does the fact sheet indicate that the "reasonable potential" evaluation was performed in accordance with the State's approved procedures?	X		
b. Does the fact sheet describe the basis for allowing or disallowing in-stream dilution or a mixing zone?	X		
c. Does the fact sheet present WLA calculation procedures for all pollutants that were found to have "reasonable potential"?	X		
d. Does the fact sheet indicate that the "reasonable potential" and WLA calculations accounted for contributions from upstream sources (i.e., do calculations include ambient/background concentrations where data are available)?			X
e. Does the permit contain numeric effluent limits for all pollutants for which "reasonable potential" was determined?	X		
5. Are all final WQBELs in the permit consistent with the justification and/or documentation provided in the fact sheet?	X		
6. For all final WQBELs, are BOTH long-term (e.g., average monthly) AND short-term (e.g., maximum daily, weekly average, instantaneous) effluent limits established?	X		
7. Are WQBELs expressed in the permit using appropriate units of measure (e.g., mass, concentration)?	X		
8. Does the fact sheet indicate that an "antidegradation" review was performed in accordance with the State's approved antidegradation policy?	X		

II.E. Monitoring and Reporting Requirements (FY2003)	Yes	No	N/A
1. Does the permit require at least annual monitoring for all limited parameters?	X		
a. If no, does the fact sheet indicate that the facility applied for and was granted a monitoring waiver, AND, does the permit specifically incorporate this waiver?			X
2. Does the permit identify the physical location where monitoring is to be performed for each outfall?	X		
3. Does the permit require testing for Whole Effluent Toxicity in accordance with the State's standard practices?	X		

II.F. Special Conditions	Yes	No	N/A
1. Does the permit require development and implementation of a Best Management Practices (BMP) plan or site-specific BMPs? SWPPP	X		
a. If yes, does the permit adequately incorporate and require compliance with the BMPs?	X		
2. If the permit contains compliance schedule(s), are they consistent with statutory and regulatory deadlines and requirements?			X
3. Are other special conditions (e.g., ambient sampling, mixing studies, TIE/TRE, BMPs, special studies) consistent with CWA and NPDES regulations?	X		

II.G. Standard Conditions	Yes	No	N/A
1. Does the **permit** contain all 40 CFR 122.41 standard conditions or the State equivalent (or more stringent) conditions?	X		

List of Standard Conditions – 40 CFR 122.41

Duty to comply	Property rights	Reporting Requirements
Duty to reapply	Duty to provide information	Planned change
Need to halt or reduce activity not a defense	Inspections and entry	Anticipated noncompliance
Duty to mitigate	Monitoring and records	Transfers
Proper O & M	Signatory requirement	Monitoring reports
Permit actions	Bypass	Compliance schedules
	Upset	24-Hour reporting
		Other non-compliance

	Yes	No	N/A
2. Does the permit contain the additional standard condition (or the State equivalent or more stringent conditions) for existing non-municipal dischargers regarding pollutant notification levels [40 CFR 122.42(a)]?	X		

Part III. Signature Page (FY2003)

Based on a review of the data and other information submitted by the permit applicant, and the draft permit and other administrative records generated by the Department/Division and/or made available to the Department/Division, the information provided on this checklist is accurate and complete, to the best of my knowledge.

Name	Becky L. France
Title	Environmental Engineer Senior
Signature	Becky L France
Date	3/17/08